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PAPERS

IN

MECHANICS.

The GOLD MEDAL *was this Session voted to Captain* JOHN PEAT, *of Bloomsbury-Square, for his Invention of a Temporary Rudder for the preservation of Ships from being lost at Sea. The following Communications were received from him; an explanatory Engraving is annexed; and a Model of the Rudder is preserved in the Society's Repository, along with additional Engravings on the subject.*

SIR,

I BEG to submit, through you, for the consideration of the Society for the Encouragement of Arts, Manufactures, and Commerce, a sketch of a temporary Rudder, invented and used by me on board of the ship Cornwall under my command, on my voyage from this country to Jamaica, in January 1811; which ship was engaged by the Transport Board for the conveyance of 14 officers, 200 privates, 7 women, and 4 children, to Barbadoes.

In lat. 44° 0′. long. 19° 30′. on my passage out, I encountered a very severe gale of wind with a heavy sea, which carried away my rudder, and the rudder braces on the stern-post: I was, therefore, under the necessity of fixing a temporary one from the best materials I had then on board. On reference to a plan of Pakenham's temporary rudder, I found it impracticable to fix a rudder constructed on his plan, on account of the heavy sea to which we were exposed. It was therefore absolutely necessary, for the preservation of the lives entrusted to my care, that I should set about the construction of a rudder, which could be brought to act in a heavy sea, or under any circumstances whatever. This, I am happy to say, I accomplished, after a progressive improvement of fifteen days, and found this machine, when substantially fixed, to act in every point with the same effect as the regular rudder. One of the great advantages of the rudder invented by me is, that it can be shipped and unshipped at pleasure with the greatest facility, and under any circumstances.

The Engraving No. 1, (left in the Society's Repository) is from a draft made by Mr. Lockwood, the master-attendant of his Majesty's Dock Yard at Barbadoes, who had an opportunity of witnessing the effect, having been aboard for some hours, when we were working the ship under all sail in sight of his Majesty's squadron lying in Carlisle Bay.

In the Engraving No. 2, (also in the Society's Repository) is an improvement introduced in the rudder, which I found it required on my passage from Barbadoes to Jamaica, which I made in six days. The improvement consists of an additional weight suspended on a jack-stay, which is necessary to be let down when going more than eight knots an hour.

At my request, a survey was held upon this rudder by the principal officers of his Majesty's Yard, and all the old masters of the ships lying at Barbadoes; who were unanimous in their opinion that the same was a better rudder than could be procured at that island; and recommended my proceeding with the ship in that state to Jamaica, which I had no hesitation in doing.

I have had the honor to submit a sketch of this temporary rudder to the Honorable the Elder Brethren of the Trinity House, who were pleased to speak in high terms of the invention, and have subscribed for twenty copies of the above-mentioned Engraving for their use.

I am, Sir,
Your most obedient humble Servant,
JOHN PEAT.

No. 11, *Bloomsbury-square,*
Oct. 24, 1812.

To C. Taylor, M. D. Sec.

SIR,

Being requested by Captain Peat to confirm and state the particulars of what I know respecting his invention of a temporary rudder, that he had made on board the ship Cornwall, then commanded by him when on a voyage from England to Jamaica.

I lament that I am not in London, where I have some papers whereby I could give dates of particular occurrences, which I stated fully in the Barbadoes newspapers on our arrival there. However, I recollect that it was on the night of the 3d of January, 1811, that the ship parted with her rudder, when it blew a perfect hurricane, and which continued, without any abatement, the succeeding day and night. When the storm subsided, Captain Peat devised a plan of making a rudder, with a spare fore-top-sail yard fixed over the stern, and by means of blocks reefed on each side, it served as a kind of paddle. The first trial was not a successful one, for want of a sufficient weight to keep the paddle under water; but which was soon remedied, for I think that it was on the 10th of January the ship answered the helm, and we proceeded on our voyage, every day discovering some new improvements; inasmuch, that on or about the 16th, he fixed his helm to the wheel, and we proceeded the rest of the voyage without any interruption, unless it was by negligence of the man who steered.

So confident was I of the safety and utility of this new invention, that on my arrival at Barbadoes, I proceeded in her to Jamaica, when I might have gone in other conveyances, a distance of 1000 miles.

At Barbadoes, the master-attendant of the King's Yard proceeded to sea in the Cornwall, by directions of Admiral Laforey, for the purpose of forming an opinion of the new rudder. On his return to Carlisle Bay, he declared that he would have no hesitation to sail to the Pacific Ocean with the rudder. He took a drawing of it, which the Admiral was to send to the Admiralty Board.

This new discovery I cannot too much praise, as being the means of once preserving my life, and the fatigue and labour which Captain Peat endured in accomplishing this machine, had nearly cost him his, by a severe fit of illness brought on by anxiety and exertions. If Captain Peat can derive any benefit from the British Government for his discovery, and of which I have bore testimony, I will add to his merits, by stating his humanity in affording comforts to 220 recruits whom he had on board, together with their wives, who were in the most deplorable situation occasioned by the storm, when the ship was unmanageable, and it being necessary to throw their beds overboard, many were sick, and received nourishment from Captain Peat's liberality.

I have the honor to be,
Sir,
Your obedient humble Servant,
JOHN RICHARDS.

Birmingham, Nov. 10th, 1812.
To. C. TAYLOR, M.D. SEC.

SIR,

IT having been represented to us by Captain John Peat, late commander of the ship Cornwall of London, in our employ, then engaged in the Jamaica trade, that he had submitted, for the consideration of the Society for the Encouragement of Arts, Manufactures, &c. &c. &c. an Engraving and model of a temporary Rudder, invented and used by him on his passage from this country to Barbadoes in January 1811, to which place he was conveying 235 of his Majesty's troops:

We consider that it would be doing Captain Peat a great deal of injustice, were we not to give him every credit due for so valuable and simple an invention, the efficacey of which has been proved by the distance run in so short a time, and the documents we have in our possession, with the information received from many experienced nautical men of great respectability, who were aboard at the time, and had an opportunity of witnessing the great ease with which the vessel was steered on the different points of sailing under all sail, and from the high terms with which it has been spoken of in this country by nautical men of the greatest experience and respectability, cannot fail of being of great utility to the public, and we consider that great praise is due to Captain Peat for his perseverance and daily improvement in substantially fitting the machine, from the idea which first suggested the construction of it.

We have the honor to enclose a letter received from Mr. Lockwood, of his Majesty's Naval Yard, Barbadoes, accompanied with a sketch from that Gentleman on the subject.

We have the honor to be,
Sir,
Your obedient humble Servant,
THOMSON, OSBOURNE, and Co.

Billiter-square, Nov. 12th, 1812.
To C. TAYLOR, M. D. SEC.

GENTLEMEN,

I HAVE the honor to forward a sketch of the temporary Rudder, by which Captain Peat governed the Cornwall to this island.

The apparent ease with which the ship reached this anchorage, the direct course she made under a press of sail, even studding sails, and the account of its action, led me to investigate the circumstance minutely, and enable me to speak very confidently of its properties; and, in order that you may have yet more information than I have time to write, I inclose the sketch with a Barbadoes paper. It was my first intention to send the plan to Mr. Robert Blachford, Chartseller, Minories, for immediate impression, and to propose giving him a right or title to the plan, by sending me 200 copies. Captain Peat suggested the idea of my sending it to you.

I therefore, Gentlemen, beg your acceptance of my humble labor; my sole wish was to render it public for the good of society, as in my opinion it not only supersedes Pakenham's rudder, which stands in such high repute, but every attempt of that nature hitherto made, and reflects the highest credit on Captain Peat for his progressive improvement upon the rude idea that first presented itself.

I have the honor to be,

Gentlemen,

Your very obedient humble Servant,

Naval Yard, Barbadoes, Feb. 18, 1811.
To Messrs. THOMSON and Co.

A. T. LOCKWOOD,
Late Master R. N.
Master-Attendant of Barbadoes Naval Yard.

Opinions

Opinions of Officers in his Majesty's Royal Navy, respecting Captain Peat's Temporary Rudder.

Captain LOSACK, of H. M. R. N., thinks that the simplicity of Captain Peat's temporary rudder is its great qualification, and never saw any thing so good under every circumstance; that it can be shipped in cases where Captain Pakenham's cannot; that few merchant-ships have spare caps; that every merchant-ship has the materials to form Captain Peat's rudder; that Captain Peat's method is much superior to that which was adopted by Mr. Nicholson, described in his *Treatise on Practical Seamanship,* and as used by him for the Grafton and Elizabeth.

It appears to Captain Losack, that with Captain Peat's rudder a ship will tack, but not with the rudder described by Mr. Nicholson, which is a matter of great consequence.

Captain HANWELL, H. M. R. N. is of opinion, that Captain Peat's invention can be executed by any merchant-ship, and readily shipped in any weather; that Captain Pakenham's rudder cannot be so shipped; that he has no doubt of a ship tacking with Captain Peat's temporary rudder. He adds, that he agrees generally with Captain Losack in the observations made by him.

Captain JACKSON, H. M. R. N., thinks Captain Peat's temporary rudder has much superiority over every other invention for the purpose that he is acquainted with; that it

Capt^{n}. Peat's temporary Ships Rudder.

Pl. 8.

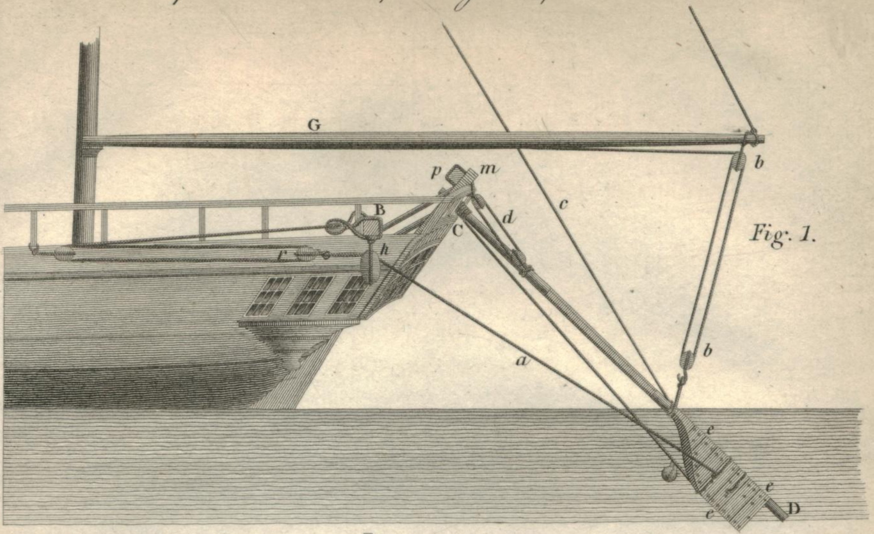


Fig. 1.

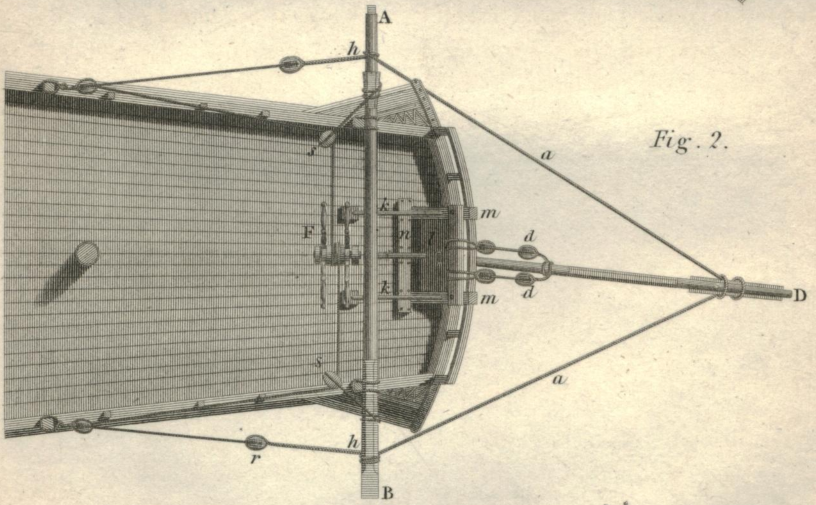


Fig. 2.

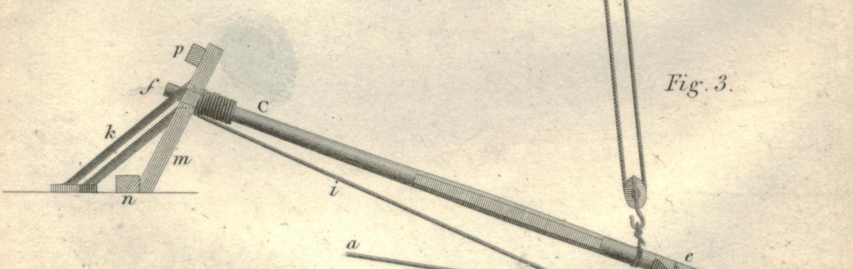


Fig. 3.

Farey delin.

Turrell sculp.

it possesses great simplicity, and that ships of all descriptions have the means of constructing it.

That in cases of heavy sea and bad weather, he is of opinion that it may be more easily applied than Captain Pakenham's rudder, but he thinks Captain Pakenham's rudder superior when once applied.

That Captain Peat's rudder appears to him more generally applicable to merchant vessels and small ships of war than to ships of the line; that he cannot judge with precision of its power, from not having seen it in practice, but he believes it can tack in all common cases.

Narrative of a Voyage in the Ship Cornwall from Portsmouth to Barbadoes, and from thence to Jamaica; together with an Account of the Loss of her Rudder, and the Invention of a Substitute; and the progressive Improvements thereon, the manner it acted, and the state of the Weather at the time. Extracted from the Log Book.

Having taken on board 225 troops for a passage out to Barbadoes, we weighed anchor on Saturday, the 29th of December, 1810, and made sail with a fair breeze at N.E. in company with the ship Cæsar, Jonathan Fowler, commander. On the 30th we were joined by the ship Posthumus.

We carried a fine breeze at east and south-east until the 3d of January, when at 3 P. M. the wind drawing round to the southward, and having the appearance of boisterous weather, we double-reefed the top-sails. At 4 P. M. very squally, brought the ship under close-reefed topsails and courses, a heavy sea getting up. At 6 P. M. battened all the hatches down. At 8 P. M. the wind increasing, split the main-top-sail, and we shipped several seas over the weather gangway.

The wind having shifted to S. S. W. blowing a perfect gale, with a heavy sea rising; at 9 P. M. we took in the topsails and courses, and hove-to under the storm staysails, and struck top-gallant yards and masts. At midnight we had very squally bad weather, and a heavy sea running.

At three-quarters past 2 A. M. a heavy sea struck the ship under the counter, which carried away the tiller, breaking short in the rudder-head. We got relieving tackles on, and chocked the rudder up as well as we could (for there were no proper chocks fitted), and the carpenter was under the necessity of chiselling the broken part of the tiller out of the rudder head.

At daylight we observed the two uppermost of the rudder braces under the counter were nearly off the stern-post.

At 7 A. M. the rudder broke adrift from the stern-post below, hanging only by the upper pintle on the rudder head (the ship steered on the upper deck). The great sea that was running occasioned the ship to labour and pitch very heavy; the rudder in consequence having so much play, began to shake the stern-post, and tear away the counter. We got a purchase on the rudder, with an intention of heaving it up to clear the upper pintle which it hung by, and then to cut it adrift; but at that moment the rudder received another shock by a heavy sea, which broke it short off under the counter: the lower part dropping astern, we hove the upper part up, and cut it away, going altogether clear of the stern frame.

At 8 A. M. a tremendous sea running, the wind backing round to the south-east. Hazy weather, and no ship in sight.

At 11 A. M. saw a ship in the S. E., distance about six miles (supposed to be the Cæsar); hoisted signal of distress to her, but not perceived.

At noon, in lat. 45° 48′, long. 18° 10′, the gale still continuing, the ship labouring very much, and making a great deal of water, all the hatches were battened down, and the dead-lights in all the windows. This day no provisions could be served out to the troops.

On the 4th of January, the gale still continuing, with a great sea running, and the ship labouring in the trough of the sea very much, we set the mizen-top-sail close reefed on the cap, to keep the ship closer to the wind, having no storm mizen. Towards night the gale increased at S. E., the ship's head to the southward and westward. In this dreadful situation we were left without any ship in company, and 263 souls on board; it then became absolutely necessary to have recourse to some expedient for governing the vessel.

Having examined carefully a book of naval tactics I had in my possession, I found a plate of Pakenham's temporary rudder with the description accompanied, which gave me some little hope of success: but on further investigation, it appeared to me quite impracticable to ship a rudder on that plan, if we had succeeded in fitting it, owing to the heavy sea that was running; besides which, I had no spare cap on board, and as we steered on the upper deck, the sea must have been perfectly smooth to succeed in getting the rudder-head up the case without materially injuring the counter.

It was at this time one of the seamen represented to me, that he had been on board a Turkish frigate in a similar situation in the Mediterranean Sea, and they managed to steer the ship tolerably well under her head sails, by means of a machine placed over the quarter or stern of the vessel (he could not recollect which), but it was made from a spare spar, with a gun-carriage fixed to the end of it.

I immediately ordered the spare top-sail yard to be got aft, and the carpenter was directed to get some 3-inch oak plank, intended as a substitute for the gun-carriage; with which to form a case, by nailing it on each side of the topsail-yard, leaving about two feet of the end of the yard clear, making it about four feet long and three feet deep, secured together, first on the inside with inch plank nailed the contrary way, having a piece of three-inch oak about one foot in depth placed on the inside of the lower end of the case, to which the planks were well nailed, and the bottom part of the case leaded over, having about 28lbs. weight to keep this part of the machine down in the water. Two guys were fitted round the topsail yard, about two feet above the case of the machine, to be brought on the quarter-deck from each quarter, to keep the machine steady,—the seaman referred to having represented they had steered in the Turkish frigate with tackles on the inner end of the spar.

Towards noon, notwithstanding the ship was straining and rolling very much, we were getting on fast with the machine. It blowing very strong gales from S. E. the hatches were still kept down, and no provisions could be served out to the troops. We saw a ship in the S. E. about six miles distance, scudding under her foresail. Hazy weather this day, and frequently pumping ship.

On the 5th of January we had fresh gales with a heavy sea. We finished our temporary rudder, and got it over the stern, which we did with greater facility by means of a tackle on the end of the spanker-boom. This tackle became of the greatest service to us afterwards in getting the machine in and out, and in the event of tacking or being taken aback, to prevent the machine from going under the ship's counter. We found it impossible to steer by the tackles on the inner end of the machine, which came on the quarter-deck over the stern. Although there was at this time a very heavy sea, I ordered the machine to be hoisted up, and launched on the quarter-deck, to make some alterations which then became absolutely necessary. The gale was abating a little, but the ship rolled very much. We set the top-sails close reefed to steady her.

We were proceeding with our improvements on the temporary rudder, and as I found it necessary to steer by this machine from the outer end, and to have out-riggers on each quarter, with blocks at the ends to receive the guys or pendants through, which were fastened round the spar two feet above the case. For the out-riggers, I ordered the spare top-mast to be laid across the afterpart of the quarter-deck, and lashed on each side to the timber heads, the ends of which projected about 12 feet outside of the quarter where the top-blocks were lashed for the rudder guys to reeve through. The ends of the guys were made fast to luff tackles hooked on to a strap round the mizen-mast, and the inner end of the machine was steadied by lashings to the midship ring bolts of the stern stantions.

On the above plan, we had great hopes that we should succeed in getting the ship's head round on the other tack, and all hands were employed in making the necessary alterations. At 11 A. M. saw a ship in the S. E. quarter standing to the W. S. W. We made all possible sail to endeavour to cut her off. At noon we were about six miles distant from the ship. The weather was more moderate, and some of the soldiers came on deck for air. The ship still continued to make a great deal of water, which it is supposed arose from the nail holes of the rudder braces, and the stern-post being strained.

On Sunday, the 6th of January, we had fresh gales and hazy weather. We hoisted a signal of distress to the strange ship. At 1 P. M. the stranger standing towards us, we took in the head sails, and hove-to under the fore and main-top-sails.

At half past 2 P. M. the ship passed within hail to leeward, wore round, and hove to at a considerable distance. We repeated the signal of distress to him again and again, accompanied with guns, but it was not till half past 3 he filled his top-sails, and passed to leeward. The sea was too rough for a boat to be sent on board, but we implored him to stay by us, or tow our head round to the westward (the wind having backed to the N. E. and we were lying up E. S. E.); but although the commander of this vessel was aware of our loss, he made sail from us at a quarter past 4 P. M. to the great mortification of every soul on board, without learning whether we were in a leaky state or in want of any supply, or where we were destined to. I have since found that this ship was named the Sally, and commanded by George Knebly, belonging to Liverpool, and bound to St. Kitts.

The rudder was finished at 9 P. M. and we got every thing in readiness to launch it on the following morning; but at daylight we made some further improvements on the plan, and tried to wear ship with the stern cable and assistance of the head sails, but without effect.

On the 7th of January P. M., although there was a very heavy swell of sea running, we got the rudder over the stern; set all the head sails, and wore ship, to the inexpressible joy of every soul on board. We let the first reef out of the fore-topsail, and set the jib to assist the steerage, having at this time eighteen men employed at the luff tackles to steer; and, indeed, she did exceedingly well under the head sails and close-reefed main-top-sail within one point of her course each way, and going the whole 24 hours 7½ knots per hour.

The wind abating, and the sea going down, we made more sail; the hatches were opened, and the dead-lights taken out. This day provisions were served out to the troops.

The ship made less water. We made additional securities to the stern frame. Latitude at noon 40° 57′, long. 18° 24′. The distance run this day, 176 miles.

On the 8th of January, we had fresh breezes, the sea going down. The machine answered the purpose. Set all the reefs out of the top-sails, and set the main-sail; straining less, and making but little water. Distance run 112 miles.

On the 9th of January we had moderate breezes at N. W.; the swell was going down. The temporary rudder answering very well, but we were still employed in making some further improvements. During the night we carried easy sail. At 10 A. M. lowered the boat, and examined the ship; found the counter and stern frame very much shattered, and the rudder braces off the stern-post. Lat. 38° 8′. long. 19° 0½′.

On the 10th of January we had light winds from the westward; making additional securities to the inner end of the machine. At 7 P. M. tacked ship, the wind variable. At ½ past 7 we were taken aback by the sudden shifting of the wind to the N. W. We found the ship to answer the steerage as well as with the proper rudder. At 9 A. M. saw a strange sail in the N. E. quarter.

On the 11th of January we had light airs from the westward. At 7 P. M. spoke the American brig Isabella, from Cork, bound to Philadelphia. At 6 A. M. wore ship to the southward, answering the helm very well. Owing to the necessity of having from 15 to 25 men constantly at the luff tackles to steer, I this day formed a plan for taking the purchase used for steering to the wheel; at the same time having in contemplation several other improvements on the rudder. At 9 A. M. hoisted the rudder in for that purpose. I have to remark, that ten hands can take the rudder in, and launch it on the deck in the space of three minutes without the least risk of injury. The carpenter was employed in making some additional securities to the two middle stern stantions, by adding to them on the inside a frame made of oak, which was filled up with two pieces of 4-inch oak plank, with a hole made in the centre, which was to receive the inner end of the machine about one foot in. The whole of this frame was shored up from the deck, first nailed and bolted to the stantions; one of which was broken, and was the cause of making this false frame. The machine had a sort of shoulder formed at eighteen inches distant from the inner end. This shoulder was made by cutting up two capstern-bars, and making cleats about eighteen inches long, nailed and well moulded round the top-sail-yard as before stated, about eighteen inches distant from the inner end; which would act in the socket, when leathered and well greased, ed, with perfect ease, chamferring or cutting-away the outerpart of the socket, so as to give the machine sufficient room to work from side to side in tacking or wearing (in which case it required to make an angle of only 12 degrees, instead of 45, which the regular rudder is supposed to do) or up and down by the ship pitching in a heavy sea; and for the greater security of keeping the inner end of the machine firm in the socket, we had two gun tackles fixed on each side of the machine, about eight feet down from the socket, fastened round the tafrail and false frame. The guys or pendants, which were fitted on the machine two feet above the case, were now fitted round the spar in the centre of the case, by cutting two holes through for that purpose.

On the 12th of January, at 8 P. M. the machine being completed, we got it over the stern, and found, to our satisfaction, the machine acted with greater effect. At 10 P. M., brought the tackle falls to the wheel, and found it answer very well, steering with two men at the wheel, the same as with the original rudder. I must here observe, that had it not been for the assistance received from the troops under the command of Captain Cameron (who was at all times desirous of rendering any service in his power), I am convinced that our crew would have been exhausted by fatigue, from the constant attendance required at the steerage, until we brought the tackle fall to the wheel; added to which, the attendance required at the pumps. During the whole of this day we had fresh breezes at west.

On the 13th of January we had moderate breezes at N.N.W. a heavy swell from the northward. This day we set the head studding sails for the first time.

On the 14th of January we had light breezes. The ship did not answer her helm owing to the heavy swell from the N. E.

On the 15th of January we had light airs. The ship did not pay attention to the rudder owing to the heavy cross swell. At 4 P. M. we got the rudder in, and added a piece of wood to the fore part of the case, and covered it over with two-inch plank, well nailed; one end of the piece being fitted into the case. This lengthened the case, at the top part adjoining the spar, two feet, reducing it entirely at the lower part of the case, which was chamferred off sharp, and leaded, as it required more weight, which made a sort of cut-water or stern to the machine; which being brought close to the spar, prevented it catching any wreck, or any thing else we might fall in with at sea, or in rivers, or roadsteads; when working ship it would prevent any ropes or cables catching it. At 4 P. M. we got the rudder again over the stern, and found it greatly improved. At 8 P. M. set all the studding sails, and got the royal masts up.

On the 16th of January we had moderate breezes; carried all studding sails, but not having yet sufficient confidence to carry them at night, took them in at 6 P. M. At 6 A. M. set all the studding sails again. Towards noon very squally weather, when we took in the studding sails. Lat. 31° 50′, long. 22° 5′.

On the 17th of January we had a strong breeze from S. E., and very squally weather. In order to prevent the ship coming up in the wind, during heavy squalls, we took-in some of the after sails, the main sail, and mizen top-sail. At 6 A. M. a strong breeze, but steady; set main sail, mizen top-sail, and top gallant studding sails, steering very well.

On the 18th of January P. M. we had frequent heavy squalls, the ship occasionally coming up to the wind from W.S.W. to S.W., and S.W. by S. We were then obliged to take in the after sails, but carried the fore top-mast studding sail all night. Strong winds at S.S.E. Lat. 29° 34′, long. 25° 52′.

On the 19th of January we had fresh breezes at S.S.E. The ship having the mizen top sail and main-sail set, and requiring a great deal of weather helm, (going 6½ and 7 knots throughout the 24 hours); we were obliged at 8 P.M. to ease the ship of the after sail. During the night we had frequent heavy squalls. At 10 A.M. got the rudder on board, and added more lead to it; the carpenter employed in making some further improvement on the machine. The ship steered herself very well by attending to the main sheet and mizen top-tail. Lat. 28° 38′, long. 27° 53′.

On the 20th January, at ½ past 4 P.M., the rudder being again in readiness, it was got over the stern, and we made all possible sail, it now steering much better than before. At day-light (a fine breeze at S.E.) saw two brigs in the S.W. with the starboard tack aboard. We made signal to speak, supposing them to be bound for Europe. At 8 P.M. spoke the brig Faith, from Buenos Ayres, bound to London, out 56 days; sent letters on board; and at ½ past 9 made all possible sail, steering very well indeed, going 7½ knots.

On the 21st of January we had strong breezes at S.E. In the day we carried all sail, the ship occasionally coming up to the windward of her course two points, but going seven knots throughout the 24 hours.

On the 22d of January we had strong breezes at E.S.E. We found the ship occasionally coming up to the wind, when all sail was set. It being on the quarter, I attribute it, in a great measure, to the trim of the ship being materially altered, by using too much water from the after hold, and the whole of the provisions being used from aft. We also found the machine to require more weight when going with great velocity through the water; for in going seven or eight knots it nearly trailed on the top of the water, instead of being in the water three or four feet, when going four, five, or six knots. At 8 A.M. got the rudder in, and added more lead to the lower and fore part of the case, and sent a gang of hands into the fore hold to pump water off the casks aft. At 11 P.M. the machine was once more got over the stern, and found to steer much better, bearing a great deal of after sail. Lat. 25° 56′, long. 34° 17′.

On the 23d of January we had strong winds at E.S.E. going seven knots. Took in the mizen-top-sail to assist the steerage. During the night very squally and strong breezes: the ship occasionally coming up from W.S.W. to S.W. At day-light a heavy sea running, the machine acting with great effect, under easy sail, going upon an average seven knots. The carpenter was employed in making a spare machine out of the derrick, with some further alterations. At noon strong trades, with a great deal of sea running. Lat. 24° 32′, long. 36° 5′.

On the 24th of January we had strong breezes at E, with a great swell from the S.E. At 8 A.M. observed the inner end of the machine had forced its way between two and three feet further through the socket of the frame in which it acted, and found the ship steered much better in consequence. Secured the cleats in their then position, and made all sail possible fore and aft, the ship requiring two hands at the wheel, but steering remarkably well; in consequence of which we declined proceeding with the other rudder, as intended; going upon an average seven knots.

On the 25th of January we had strong breezes at East. Royal and studding sails, main-sail, spanker, and all sail set; the reefs out of all the top sails, and the ship steering very well, and required to be pumped only twice in twenty-four hours. Lat. 22° 18′, long. 40°.

We now considered the machine to be as complete and firmly fixed as it possibly could be, carrying all sail day and night. From this time until we made the island of Barbadoes nothing material occurred, which was on Sunday the 10th February, at ½ past 11 P. M., bearing West four or five leagues distance: Moderate breezes at E. N. E. Took the studding sails in, and hauled to the Northward, under easy sail. At 4 A. M. wore ship to the Southward. At day-light the S. E. end of the island bore S. W. At noon sailing along the island, distance five miles. At 2 P. M. took in studding-sails, and hauled up for the shipping in Carlisle Bay, and anchored in eight fathoms water. Found lying there His Majesty's ship Dragon, of 74 guns, Rear Admiral Sir F. Le Forey, with three frigates, seven brigs, and four schooners, and about ten sail of merchantmen.

On the 11th of February, at 8 P. M. waited on the Admiral to acquaint him of our situation. Several gentlemen of the navy, and from shore, came on board to inspect the machine.

On the 12th of February we disembarked all the troops, government stores, and water casks. A survey was held on the ship by three gentlemen from the dock yard, viz. Mr. Ward, the master builder, Mr. Lockwood, the master attendant, and Mr. Cruso, the Admiral's carpenter, and two masters of merchantmen; who unanimously recommended the ship to proceed on her voyage to Jamaica, with the temporary rudder, without any alteration whatever: which survey has been attested, on oath, at the Notary's office.

On the 13th and 14th of February many persons came on board to inspect the machine. Mr. Lockwood, the master attendant, came on board to take the plan of the stern frame, and rudder, which he much approved of, from the simplicity of its construction.

On the 15th of February, at 7 A. M. weighed anchor, and made sail, attended by Mr. Lockwood, for the purpose of witnessing the effect of the machine. Made all sail upon a wind, and steering as well as with the regular rudder; standing off and on in sight of His Majesty's ships, lying in Carlisle Bay, and tacking with great facility until 6 P. M., when we bore away, and made all sail possible. From this time, until we made the East end of Jamaica, at noon on the 22nd, the machine acted with equal effect on the ship as with the proper rudder, and carrying the same sail, having frequently very strong breezes, and a heavy swell, the ship for many hours together going nine and ten knots; making the passage, from Barbadoes to Jamaica, in a little less than seven days.

On the 23d February we anchored in Port Royal Harbour, and found lying there H. M. S. Polyphemus, Vice Admiral Rowley.

Thus ended a voyage in the ship Cornwall, having only sailed four days from England when she lost her rudder, and afterwards run a distance of at least 1250 leagues; being at sea 41 days, with a machine invented and improved upon progressively, on her voyage, for 18 days, when it was considered complete, and supplied the place of a regular rudder, far beyond our expectations, considering the rude idea which first presented itself.

Reference to the Engraving of Captain PEAT's *temporary Rudder, which can be quickly fitted out by a Ship's Company, when at Sea; and from such Materials as they always have on board. See Plate* 8, *Fig.* 1, 2, *and* 3.

PLATE 8, fig. 3, shews all the part of this contrivance detached, and ready for launching over the ship's stern; fig. 1, shews an elevation of it in action; and fig. 2, a plan answering thereto. The invention consists of a topmast, placed out of the ship's stern, having planks fixed at the end of it, which go edgeways through the water; the mast is attached to the stern by a kind of joint or socket, on which, by proper guys, it can be inclined in an angle, with the keel either larboard or starboard; and will steer the ship as effectually as a proper rudder.

To fit out a ship on this plan, the following materials must be collected and prepared as soon as the rudder is gone, or expected to be lost.

1st. A spare top-mast A B, fig. 2, and two top blocks *h h*, which must be securely lashed on at each end of it.

2nd. A top-sail-yard C D, which must have cleats, nailed securely upon it, forming a shoulder at the end C, which is to be kept on board; and at the opposite end must be framed a case *e e e*, formed of pieces of oak plank, nailed firm to the yard, on each side, the left or foremast part being chamfered off and leaded: so that by presenting a narrow edge it may make the less resistance in passing through the water.

As the taff-rail will not, in general, be found sufficiently strong to resist the force of the machine; a frame *k l m n*, must be composed of substantial pieces of oak, and erected behind it, upon the deck; it consists of two uprights *m m*, set up from a sill *n*, which is spiked down upon the deck: and they support a rail *p*, which is firmly lashed to the taff-rail: and the whole is strengthened by three shores *k k*, stepped from the deck to the uprights *m m*; between these is supported a piece of oak *l*, 4½ inches thick, with a hole through it, of a proper size to receive the end *f*, of the yard; the hole is leathered inside, in which the end *f* of the yard acts with perfect ease, and can swivel about in all directions; the tapered end *f* of the yard is leathered also, that the whole may act easily.

While these parts are preparing by one part of the crew, some should get the top-mast A athwart-ship, over her quarter, and make it fast by proper lashings; the others should be ready with the several tackles which rig it out, to give motion to the rudder when in the water. They are as follows: Two principal guys, *a a*, made of rope, which is 5½ inches girt, and should be of very good materials; they are to be made fast to the boards at *e e*, and carried through the top blocks at *h h*; the end has the block *r*, of a liff tackle purchase, turned in; the other block being lashed to one of the stanchions on the ship's quarter, and the fall carried through the leading blocks *s s* to the steering wheel F, situated upon the ship's deck.

A topping lift, *b b*, suspends the weight of the rudder from the spanker-boom G: it is a gun tackle purchase, and is of great use in getting the machine out of the water, and also to assist in getting it in; the fall of the purchase is carried along the boom to a cleat spiked to it.

c is another topping-lift from the rudder to the mizen-mast head; it likewise assists to get in the machine, as well as for a substitute, should either of the guys break; it should be 3½ inch rope.

Two short luff tackles *d d*, fixed to the taffrail and cross piece *p*: they are for the purpose of holding the end of the mast firm in the socket, and materially aid in placing and displacing it.

A jack-stay, *i*. This is a rope stretched tight from the planks at *e e*, to the other end of the mast; on this a weight, *t*, is suspended. The machine is ballasted sufficiently for common occasions when the ship is going less than 8 knots; but this additional weight, consisting of shot sewed up in canvas, is to assist in keeping the whole of the machine in the water, when going more than 8 knots; and when going less, to be hauled up by the line *v*.

The mode of operation in this machine will appear evident from the above description; the steering wheel F, being turned either way, acts to bring in the fall of one of the guys *a*, and give out the other, producing an inclination of the rudder, as in fig. 2, so as to put the ship about as expeditiously as a common rudder; and upon the same principle, viz. that of making a resistance to the ship's motion, on either side of her keel, at pleasure. The ship Cornwall, in which the contrivance was first tried, had her wheel fitted close to the rudder-head, and she steered with a short tiller abaft the rudder. In ships fitted in the common manner, the tackles would lead to their wheels in a similar way; the only alteration from the figure being, that the wheel is placed much farther forward on the deck, and the leading blocks *s s*, are of course placed opposite to it.

Certificate and further Observations from Mr. A. Lockwood, Master-Attendant of H. M. Naval Arsenal, Barbadoes.

The Cornwall lost her rudder on the morning of the 4th of January, and got this machine over on the 7th at noon; arrived at Barbadoes on the 11th of February, and at Port Royal on the 23d. During the passage from Barbadoes to Jamaica, this machine acted with great effect, the ship carrying royals and all studding sails night and day, and for several hours together going 10 and 10½ knots; during which time she required less wheel than with the common rudder, and at no time did the temporary rudder require to make an angle of more than 10 degrees, either in the act of wearing or tacking.

This simple, and truly ingenious method of governing a vessel in distress, I recommend earnestly to the notice of all persons subject to casualties, that may require an expedient of this kind; and although temporary rudders are no new subject, yet the one here delineated is unquestionably the best ever held to public view. Little more need be said in its praise, than the concurrent opinions of seven professional men (whom I know to possess clear judgment) that the rudder was superior to any that could be made at this island, and they had no hesitation in recommending Captain John Peat to proceed on his voyage to Jamaica, without any alteration in it whatever; and I can venture to assert, without hesitation, that the machine in question not only supersedes Pakenham's rudder, which stands in such high repute, but every attempt of that nature hitherto made, and reflects the highest credit on Captain Peat for his progressive improvement upon the rude idea which first presented itself.

The circumstances favourable to the machine are, first, its being composed of such materials as vessels of any description are possessed of; secondly, the simplicity of its composition superseding the absolute necessity of a carpenter; thirdly, that it may be constructed and put in action, even in a gale of wind, in two, or at most three hours. Its properties are, 1st. That it can be shipped at pleasure without delay, and with very little trouble; 2d. That it cannot, by any shock or violence, be rendered unfit or useless; 3d, That the guy tackle fall, being brought to the wheel, requires only the same force to steer as the common rudder; that the ship is under complete command, as will appear by the ship's log-book, in all the following cases:

" Gale of wind, heavy sea, wind quarterly."

" Light winds, heavy swell."

" Fresh wind, spanker, main-sail and all sail, on a wind, off the wind."

" Staying and wearing."

The sole object of this, my humble labour, being to promote, in however small a degree, the good of the nautical world; I cannot in justice drop the subject without suggesting what, in my opinion, would be, with little additional trouble, a very great improvement. The body of dead water occasioned by the flat open part *x*, of the planks at the end of the yard, tends to impede the ship's progress, and to force the case upwards, which consequently strains the guys when going very quick. The dotted lines at *x*, fig. 3, I propose to be a piece of plank to be continued on the end of the topsail-yard, so formed or filled up as to carry off the body of water complained of.

(Signed)
ANTHONY LOCKWOOD.

The SILVER MEDAL *was this Session voted to Mr.* GRANT PRESTON, *of Burr Street, London Dock, for his Ship's Binnacle and Lamp, by means of which the Ship's Compass is seen with clearness and certainty. The following Communication was received from him, an explanatory Engraving is annexed, and a Model is preserved in the Society's Repository.*

SIR,

BEING sensible that you are ever ready to attend to useful improvements, I take the liberty to inform you, that I have brought to the Society, for their inspection, one of my improved Binnacles, in which the light of the lamp is thrown upon the whole face of the compass clear and bright, without being liable to dazzle the eye of the men at the wheel or tiller, or to be seen by an enemy at sea. The lamp is inclosed in a case; it can be lighted below, and brought safely on deck in any weather. The expense of the oil for burning is very small.

I have been making them for some years, and have added various improvements. As I find them to give perfect satisfaction, I have been induced to apply to you, hoping the

Pl. 9.

Mr. Grant Preston's Improved Ships Binacle, & Lamp for Illuminating it.

Fig. 2.

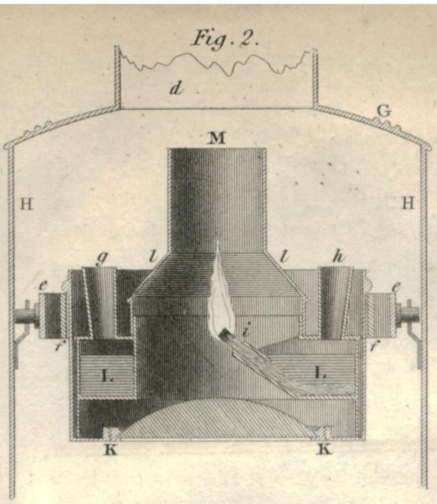
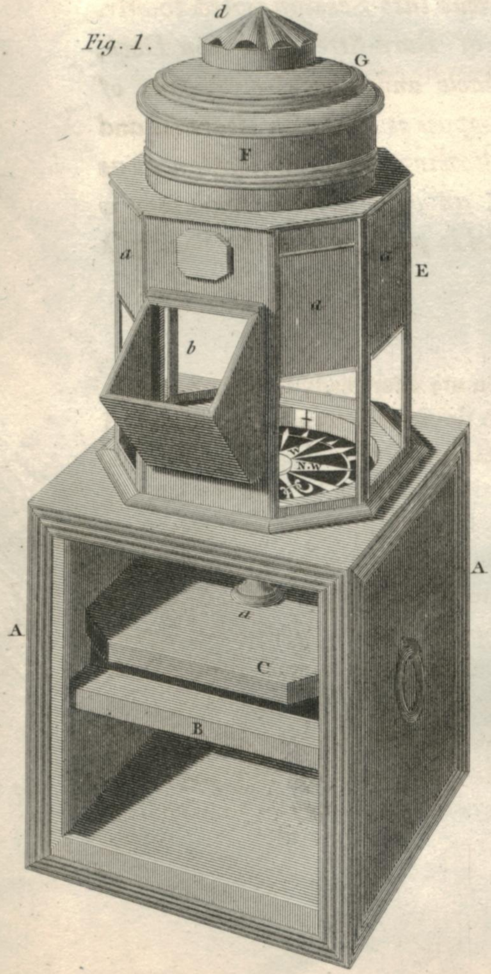
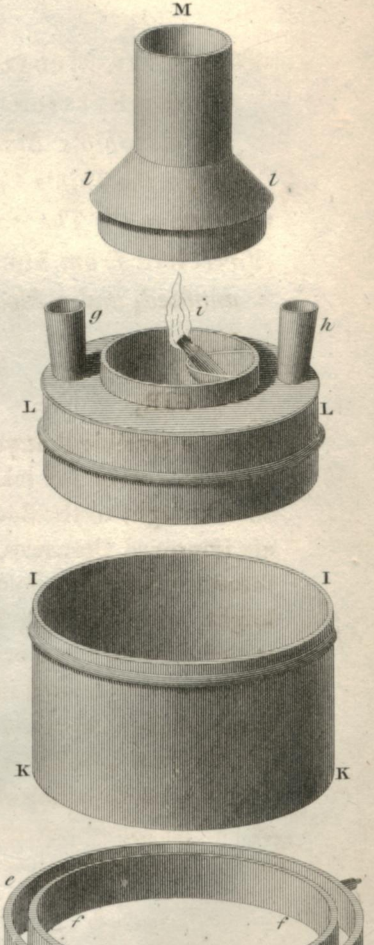


Fig. 1.





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E. Turrell Sculp.

the Society will condescend to consider the merits of an article so important to navigation, and a matter where so many lives and such immense property are concerned.

I am, Sir,
Your very humble and obedient Servant,
GRANT PRESTON.

38, Burr-street, London Dock,
Nov. 4th, 1812.

To C. Taylor, M.D. Sec.

Certificates.

Dear Sir,

I readily comply with your request to bear testimony to the completeness of your improved Binnacles with luminous lamps, a matter of much consequence to shipping. I have the satisfaction to say, that after trials of thirteen or fourteen voyages between London and Leith, on board the Caledonia, I find them superior to any thing of the kind. Wishing you success,

I am, dear Sir,
Your's truly,
ROBERT NOSBOLD.

Caledonia,
Leith aud Berwick Wharf, London,
Nov. 14th, 1812

To Mr. Grant Preston.

SIR,

It gives me great pleasure to have it in my power to recommend to the public your valuable Binnacles. I have had one of them on board the ship Emelina nearly two years, and I can assure you, that I have never met with any thing equal to it. I can strongly justify the recommendation of them to every commander and master's notice.

I am, Sir,
Your obedient humble Servant,
Edward Salter.

29, Great Prescot-street, Whitechapel.
Nov. 17, 1812.

To Mr. Grant Preston.

SIR,

I have had trial of one of your improved Binnacles with the luminous lamp on board the Eliza for about two years, between London and Leith, and I have to say, that it meets with my approbation, and is worthy to be encouraged.

I am, Sir,
Your obedient Servant,
Thomas Marshall.

Eliza,
Miller's Wharf,
Nov. 17, 1812.

To Mr. Grant Preston.

⁂ Captain Mackay attended personally at the Society's house, and stated, that he had used these Binnacles on board the ship Lord Forbes, and found them to exceed his expectation; that a good steady light on ship-board is of infinite consequence, and he found this Binnacle to answer every desired purpose, giving a sure steady light, and requiring only a small consumption of oil, viz. about three wine-glasses in twelve or thirteen hours. That in this Binnacle he can in the day-time see all the bearings without moving the compass, and that at night the light may be secluded from the sight of every person but the steersman.

Reference to the Engraving of Mr. Grant Preston's improved Ship's Binnacle, and Lamp for illuminating it. Plate 9, *fig.* 1, 2.

The binnacle or box which contains the compass, in ordinary ships, is a very imperfect and inaccurate contrivance; it is a box situated upon the deck, with a partition, dividing it into two chambers, one for containing a lamp or candle, and the other for the compass-box; the partition having a pane of glass in it to admit the light upon it, and the front of the division, where the compass is kept, has also a window to see into it. The compass-box is generally made of wood, and square, containing within it a circular brass box, suspended on gimbals, and in this is the compass card; its points are read against a mark, usually made by a pencil, withinside the brass box, and called *Lubber's Mark.* A line drawn from this to the center of the compass card, should, in all cases, be exactly parallel to the line of the ship's keel, otherwise her course by the compass will never be correct; the manner in which the compass-box is fitted into the binnacle, renders this very uncertain, for the square box being smaller than the inside of the binnacle, wedges are driven in all round to make it fast; but there is nothing to make it certainly parallel to the ship's keel. The binnacle is frequently made with three divisions instead of two, then a compass is placed in each side, and the light in the division between them; but, unless the binnacle is very large, there is an objection to placing two needles so near together, as they are liable to act upon each other. The light is very imperfectly thrown upon the compass card in the common way, and may also be seen at a distance from the ship.

The binnacle invented by Mr. Grant Preston has a cylindrical top, which incloses the lamp in a case, being on that account convenient for lighting below in case of bad weather, which convenience has been long wanted by mariners; the body and upper part of this case being made of copper, renders them very durable and compact. The lamp gives a powerful light vertically on the compass; is simple in its construction, steady in its burning, and the expense of the oil small; no light is seen to dazzle the eye of the man at the wheel or tiller, nor is any light shewn which can be seen by the enemy at sea.

Fig. 1 of Plate 9, is a representation of this machine in perspective, as it stands upon the deck of a vessel opposite to the steering wheel. Fig. 2 is a section of the box, containing the lamp and reflector; and the remaining figures are views of its different parts, detached.

AA, fig. 1, is a square box, closed by a door in front, which is omitted in the figure, to shew the interior. This box is fixed down, in a proper situation, on the deck, and supported at a height favourable to view the compass-card which it contains; the two sides being exactly parallel to the ship's keel. B is a shelf in the box, to support a board C, which exactly fits the box, but has its angles taken off to permit it to slide in and out more freely; it has a stem, *a*, of brass wire standing up from the center of it, and terminating in a sharp point, on which the compass card is freely suspended to turn round; being then included within a circular opening made through the top of the box, and its divisions reading against a line (called by the seamen "*Lubbers Mark*") drawn on a piece of white paper seen plainly in the figure. The opening in the top of the box is surrounded by an octagonal lantern E, which has glass panes in all its sides, half way up from the bottom, to admit light in the day time, but at night these are closed by sliding shutters *a a a*. The compass is seen through the glass *b*, which is placed at a proper inclination to command the view of the card; the lamp is situated in a circular box, fitted into a ring F, at the top of the lantern frame; and has a dome G, with a chimney *d*, to take off the smoke. The section, fig. 2, will explain the interior parts, H H are the sides of the cylindrical box, which fits into the ring F, fig. 1; *e e* and *f f*, are the sections of two brass circles, called the gimbals, see the separate figure below; the external one has two projecting points, which are received in pieces of copper soldered to the inside of the box; the internal ring has similar pivots, but these are received into holes in the outer ring, the direction of the two lines of pivots being at right angles to each other, hence the interior ring, and all which it supports, has an universal motion, and if properly balanced, will preserve its horizontal position in any inclination of the box. I I, K K, is a brass box, also shewn separately beneath, which fits into the ring F, and has in the bottom of it a large plane convex lens K K, which concentrates the light of the lamp above, and throws it down upon the card beneath. The lamp L L, see also the separate figure, is just within the box: it consists of a deep copper hoop, forming the external surface; a lid at the top, and a bottom half way down, which have each a large hole through their centers, and may therefore be considered as rings; another hoop being soldered within these rings, forms a complete hollow ring, in which the oil is contained, as shewn at LL, fig. 2, being filled at two tubes *g h*. The wick *i* is situated in a kind of spout, which proceeds from the interior of the ring to its center; and, being very narrow, diminishes very little of the light; for, as shewn in the figures, the flame is caused to project over the end of it, and then comes in the center of the whole, that the lens KK may throw the light down with the greatest effect; and to increase this, a reflector is added. This is a kind of conical chimney, M, see also the detached figures, which stand over the lamp, and includes the light; the conical part, L L, of this, is tinned withinside, and well polished, to reflect the light downwards. By this means the card is always well illuminated, and if the shutters *a a* are put down, no light is shewn which could be perceived by an enemy at sea, for the only aperture *b* directs the light upwards, and that in a direction where it will not fall upon any part of the ship.

The lamp is easily trimmed or lighted, by taking out the box H from the ring at the top of the lantern; the lamp of course comes with it, and there is a large hole in one side, to give access to it; if it is to be filled with oil, the box is turned upside downwards, and the gimbals *e f*, as before mentioned, keeping the lamp horizontal, it may be filled or taken out, to clean the conical reflector, and the lens also if they require it.

The SILVER MEDAL *and* TWENTY-FIVE GUINEAS *were this Session voted to Mr.* THOMAS ROBERTS, *of Wardour-Street, Soho, for Elevators or Machines by which Persons can be raised up to a great Height, and which Machines may be employed as Fire Escapes, Observatories, or for Repairs of Buildings. The following Communication was received from him. Two explanatory Engravings are annexed, and a Model and a Drawing of the Machine are preserved in the Society's Repository.*

SIR,

HEREWITH I send a Model of an invention for the consideration of the Society of Arts.

I constructed this Model with the view of its being rendered serviceable in the event of a siege. I thought it might also be applied for the purpose of an escalade, as it might be used and removed with ease from place to place, as might be required.

It may also be used as an observatory, or to assist persons in cases of fire, or on many other occasions.

Attached to the landing there is a bridge, which will easily be placed in a direction so as to communicate with a wall or window.

The Drawing sent with the Model is intended to shew a more simple and cheaper method of effecting the same purposes, and may be raised with equal facility by one screw instead of four which are employed in the Model.

Any further explanation which may be desired I shall be ready to furnish, and am,

Sir,
With the greatest respect,
Your most obedient humble Servant,
THOMAS ROBERTS.

25, Wardour-street, Soho,
April 5, 1813.

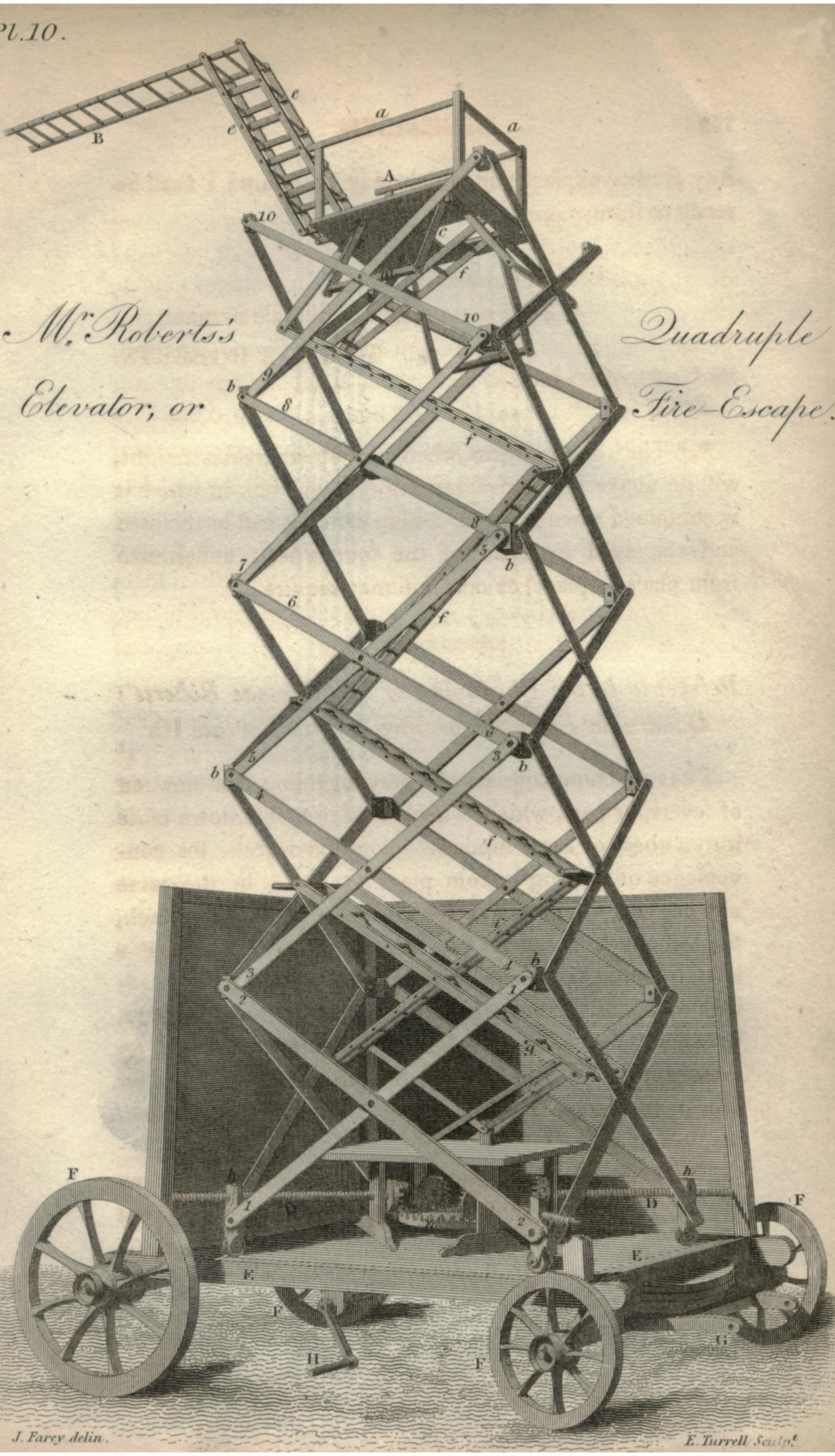
*** The whole machine, when raised to its greatest height, will be above four times the height of the box in which it is contained when lowered, and in which it can be inclosed and conveyed by means of the four wheels underneath from place to place, as occasion may require.

Reference to the Engraving of Mr. Thomas Roberts's Quadruple Elevator, or Fire Escape. Plate 10.

This machine consists of a very ingenious combination of levers, or bars, which, when out of use, shut down close into a chest or case, mounted upon four wheels, for convenience of moving it from place to place, in the same manner as a fire engine. By turning a handle or winch, the levers are caused to rise out of the box, forming a lofty pyramid, as shewn in the figure, which, having ladders within it, makes a convenient scaffold and staircase, by which any person can ascend to a platform situated on the top, to assist others in escaping from a house when on fire, or for many other purposes, to which this machine may usefully be applied.

The levers are forty in number, and are arranged in four sets, forming the four sides of the frame or pyramid; as the levers

Pl. 10.



Mr. Roberts's Quadruple Elevator, or Fire-Escape.

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E. Turrell Sculp.t

levers of all these four sides are connected together in the same manner, the letters of reference are only marked upon one side, which is the front, to avoid the confusion of such a number of letters. The ten levers belonging to this front side are marked 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10: they are jointed together in pairs, by center pins passing through the middle of each; thus the pairs 1 and 2, 3 and 4, 5 and 6, 7 and 8, 9 and 10, are united together by their respective centers, so as to open and shut, in the manner of a pair of shears; these pairs are again united together at their ends, 2 and 3, 4 and 5, 6 and 7, 8 and 9, 1 and 4, 6 and 3, 5 and 8, 7 and 10. The consequence of this arrangement is, that by bringing the lower ends 1 and 2, of the first pair of levers together, the upper ends 1, 2, are also made to approach each other, and carrying with them the lower ends of the second pair 3, 4, causes them to shut towards each other. These operate upon the next pair, and so on up to the top. Thus the ends of the whole system of levers are caused to approach each other at the same time, which, by bringing all of them nearer to the vertical position, increases the height of the pyramid to almost any required extent, until they are exactly vertical. It is upon this principle that the frame is made to rise up to elevate the scaffold A, which it bears upon its top to a sufficient height to reach the upper window of a house, &c. The center pins which unite the extremities of the levers together, are screwed into blocks of wood *b b;* and the center pins of the levers, forming the other side of the frame, being fixed into the same blocks, the different sides of the pyramid are united together, as the figure shews too plain to require any other reference. The scaffold or platform A, at the top of the machine, is supported from the center pins connecting the upper pair of levers 9 and 10. These pins have, within-side the frame, horizontal rails *m* attached to them; at the extremity of these are jointed rods *c c*, which at the upper ends, are connected by the joints to the four angles of the platform A, so as to carry it up horizontally, when the frame is elevated. A hand-rail *a a*, surrounds the edge of the platform, at a proper height, to prevent persons falling over. An apparatus is also erected upon this platform, to form an horizontal communication with the window of a house, &c., when the machine is placed at some distance from it: it consists of two ladders *e e*, placed at a small distance asunder, and parallel to each other, being united by a number of bars extending from one to the other, and connected to them by joints. Both ladders move at their lower ends, upon a center pin, which is fixed to the platform, so that they can incline either way at pleasure; to the top of these two a third ladder B, is jointed, in the same manner as the horizontal rails which connect the two together. This communicates with the window of the house, and may be made to reach out to any moderate distance, by inclining the two ladders *e e* on their centers; and in all positions it will retain its horizontal position, so that a person can safely walk along upon it from the window of the house, and descend by the ladder *e e* to the platform; and thence, by means of the ladder *ff*, situated in the inside of the machine, to the ground. These ladders are extended from pieces of wood fixed to the joints or center pins of the respective levers, so that in all positions of the frame they form a continued staircase or ascent from one ladder to the next; the inclination of the ladder altering in the same degree as the levers of the frame, to which they always remain parallel. The whole machine is, as before-mentioned, mounted on the four wheels F F F F, and is drawn by shafts, connected to the pieces G, which project from the axletree of the fore-wheels, in the same manner as a fire engine or other four-wheeled carriage.

The lower ends 1 and 2, of the first four pair of levers, are caused to approach each other for the purpose of elevating the pyramid, by means of four large screws D D at the bottom of the machine. They have pivots at the ends, which are received into pieces of wood fixed to the floor of the carriage E E, on which the machine is erected, so as to turn round freely; and they operate upon female screws within the pieces of wood *h*, to which the lower ends 1, 2, of the levers are jointed; these pieces of wood have also rollers running upon the floor of the carriage, to diminish the friction of advancing the ends of the levers together, when the machine is to be elevated, which would otherwise be very great, as these rollers support the whole weight of the superstructure. The four screws D, radiate at right angles from the center of the machine, and have toothed-wheels fixed upon the inner end of them, which are actuated by a horizontal crown wheel *m*, common to them all, and situated in the center of the machine, within a square frame formed by the four pieces of wood, which bear the pivots of the screws D D. Now it is evident, that by turning this central wheel, the four screws will all be put in motion uniformly together, and operating upon the pieces of wood *h h*, will cause them all to approach or recede from the center together; and, carrying the ends 1, 2 of the levers with them, the frame is made to rise up out of, or descend into, the chest at pleasure.

The central wheel *n* is fixed upon an upright spindle, which has another crown wheel fixed upon it beneath the floor of the carriage; and this is turned by a small pinion fixed upon an axis, proceeding to the side of the carriage, where the winch H is applied to the end of it; this being turned round by a man, turns the wheel *n* with a considerable power, and elevates the frame. The ladder marked *g*, within side the machine, at the lower part, shews how a second set of ladders may be applied, so as to make two complete staircases from the bottom of the machine to the top, but only one set of the ladders is shewn, to prevent confusion. The lower end of this ladder, as well as that marked *f*, is supported by a rod, jointed to it, and extending to a joint on the top of the square frame in the center of the machine.

The Model deposited in the Society's collection contains also a very ingenious contrivance for preserving all the steps of the ladders horizontal, let their elevation be what it may. This cannot be shewn in the Plate, but may readily be comprehended without a separate figure. The steps of the ladders are fitted to the sides or cheeks by two center pins instead of fixed tenons, and have each a tail projecting in the middle of their back or under sides. These tails are all connected together by a rail or bar, which has slits or mortices through it to receive those tails, and holes are made both through the sides of the mortises, and through the tails which receive pins, upon which the tail turn. By this means all the steps of the ladder are preserved in a parallel position to each other, however they may incline on their respective center pins, on the same principle as the bars of a parallel ruler or Venetian window-blind, which likewise act in a similar manner to the steps of these ladders. The long platform, forming the upper and lower steps of each ladder, which are also the landing-places from one ladder to the next, are attached to the center pins which unite the pairs of levers of the frame; and thus they are always kept in a horizontal position, and by means of the bar or rail behind the ladder, all the other steps are kept horizontal likewise. The ascent is thus rendered extremely easy and safe.

Reference to the Engraving of Mr. THO. ROBERTS's *Elevator, or Fire Escape. Plate* 11.

Plate 11 contains a representation of another form of machine likewise invented by Mr. Roberts for the same purpose as the preceding; but, being of a less expensive construction, it may perhaps prove of more general utility.

It is upon the same principle as the other, but has only three sets of levers or bars, situated parallel to each other, instead of four, arranged on the different sides of a pyramid: by this means a single screw is sufficient to elevate the whole. A A represents the frame of the carriage, mounted upon the four wheels BBBB. At one end of the carriage are fixed blocks, CCC, for the joints of the lower ends of the levers AAA to be attached to; these are jointed to others, DDD, which rest, by means of rollers, on the frame; and the middle one has a block of wood with a female screw, through which passes the screw E, on turning which, the ends of the levers DDD can be brought towards the ends CCC, to elevate the machine; the other pairs of levers, which are erected upon the lower pair, will be readily understood, from what has been said of the first machine: observing first, that the three parallel sets CCC, &c. of levers, are held together by the center pins which unite their joints, being common to all three, as is shewn at *a a a*.

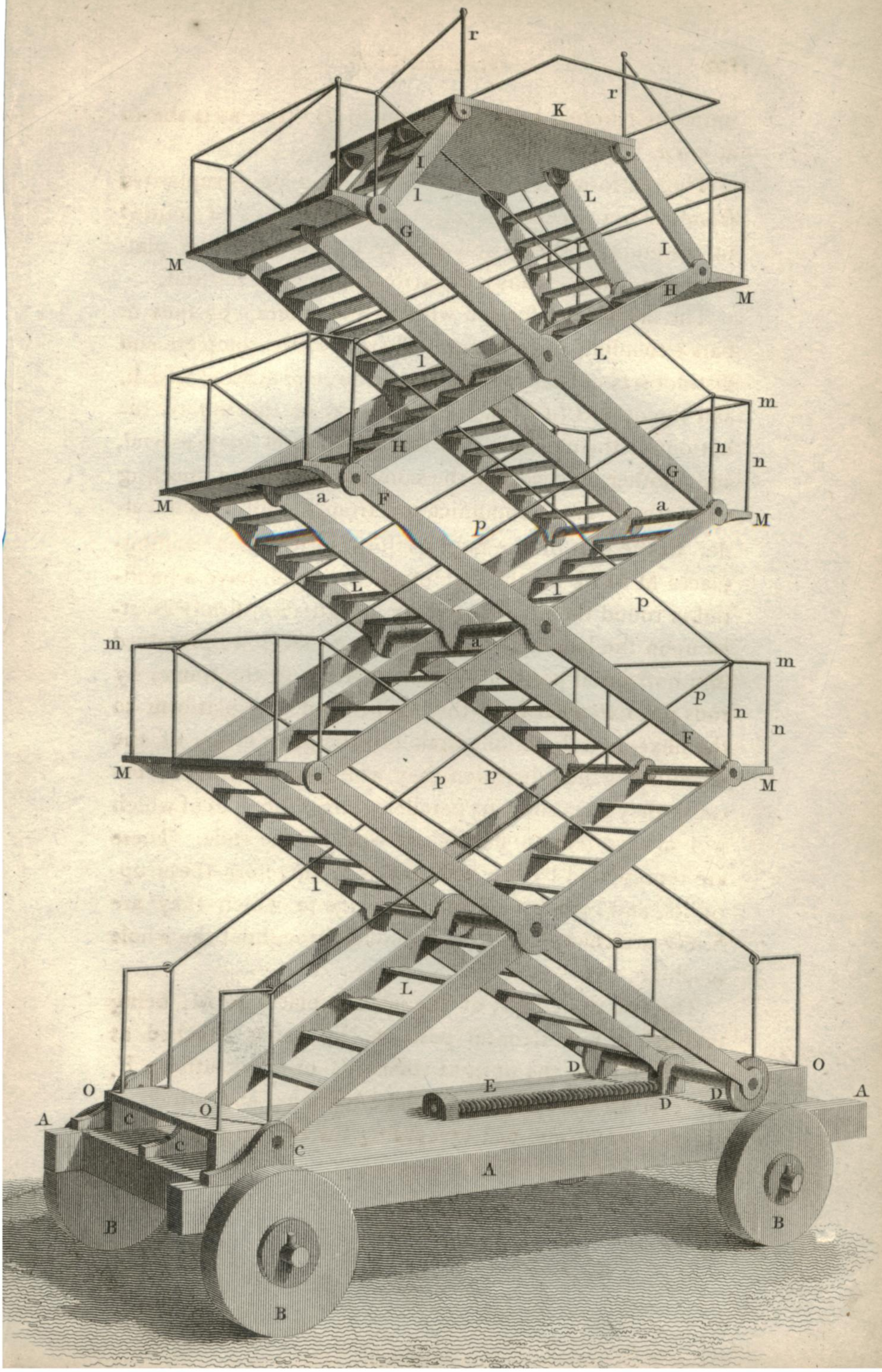
The platform K, at the top of the machine, is supported from the upper pair of levers, GGHH, by rods I I, jointed to the ends of them, and also to the angles of the platform, by which means it is carried up parallel to itself.

The ladders are formed within the frames, by rails or bars extending across them. There are two complete and distinct sets of ladders in this machine, one marked LLLL, and the other *l l l l*, each extending from the top to the bottom of the machine; so that one person may ascend, and another descend, at the same time, without meeting each other. The communication from the top of one ladder to the foot of the next is formed by small landing-places M M M at the end of each, which have a hand-rail *m* round them, supported by uprights *n n*, firmly erected upon the landing. These landing-places are preserved in a horizontal position, in all situations of the frame, by rods *p p*, extended from the hand-rail of one platform to the next, in a direction parallel to the great levers of the machine, which direction they will always maintain, because they form so many parallelograms, the sides of which will always remain parallel, as will also the ends. These are represented by the uprights *n n*, therefore these uprights, and consequently the landings to which they are firmly attached, will remain parallel throughout the whole machine.

The two uppermost of the landing places M M, being retained in a horizontal position, by being attached at right angles to the upright standards of the platform K, preserve all the rest in a similar situation; and which is still farther maintained by causing the extremities of the lower

Pl.

Mr. Roberts's Elevator, or Fire Escape.



lower platforms O O O to rest upon the basis or frame of the machine likewise.

In this machine, the steps of the ladder may easily be kept horizontal and parallel to each other, by the same means as described for the former machine, viz. by a rail carried behind the steps to connect them all together, they moving on center pins like Venetian blinds; the rails are also jointed to the landing places at the top and bottom of each ladder, which being kept horizontal by the means before-mentioned, all the steps keep so likewise.

The SILVER MEDAL *of the Society was this Session voted to Mr.* G. HUGHES, *of Manchester, for the Invention of a temporary Scaffold moving round an upright Pole, by the use of which the Interior of Domes may be easily repaired and beautified. The following Communication was received upon the subject, an explanatory Engraving is given in this Volume, Plate 2, and the original Drawing preserved in the Society's Repository.*

SIR,

I TAKE the liberty to inclose to you a sketch of a Scaffold which has been used for repairing and beautifying our Exchange. It is the invention of Mr. Hughes, a respectable painter and plaisterer of this town If its utility and simplicity should strike you as forcibly as it has done me, the patronage of the Society would very highly oblige him, and render it useful to the community by giving it publicity in such way as the Society may think proper. Its utility is confined in a great measure to the repairing or finishing of circular buildings. The actual expense of its erection did not exceed four pounds, and the estimate of a scaffold in the common way would have been forty to fifty pounds. I flatter myself you will excuse this freedom, more particularly from its originating in a town with which you have had so long and intimate connection.

I am, very respectfully,
Sir,
Your obedient Servant,
JOHN BRANCH.

Manchester, Oct. 26th, 1812.

To C. Taylor, M.D. Sec.

Reference to the Engraving of Mr. Hughes's *Temporary Scaffold for repairing Domes. Plate 2. Fig. 1.*

This scaffold is contrived to move round on an upright pole, in the center of the dome, and on two wheels running on the floor, so that it can be turned to all parts of the interior of the dome. Fig. 1, of Plate 2, represents an oblique elevation of the scaffold, as erected in the dome R R of the building S. The chief support is a straight scaffold pole A A, which turns on a pivot at top, supported by a piece of wood fixed across the top of the dome in the center; and is supported at bottom on another pivot, resting in a step of wood fixed on the floor. To this pole a light a light braced frame is fixed, and traverses round on two rollers BB; these are situated at the bottom of the two upright legs K K, which are nearly as high as the walls of the building. The tops of these support the ends of two curved planks CC, the upper ends of which are bolted on each side of the center pole at D. Between these planks a number of boards or planks are placed horizontally, so as to form a scaffold, on which the workmen stand to work at the interior of the dome, at any height they find convenient. The width of these steps gradually diminish from the space between the two uprights B B, to a very small width at the pole near D. The whole is braced by the two diagonal stays I I, extending from the bottom of the uprights BB, and secured to the upper part of the pole at E. The curved planks C C, are also strengthened and supported by the short braces FF, G G, and H H, which extend from the stays I I to the curves C C; these form a strong and secure scaffold, which may be easily moved round to any part of the internal dome at pleasure. To strengthen the frame sideways, diagonal braces are applied between the two uprights K K.

Twenty-Five Guineas *were this Session voted to Mr.* **George Prior,** *Jun. of Otley, in Yorkshire, for his Method of preventing the ill Effects arising to the Workmen from inhaling the small Particles of Iron and Stone in grinding or pointing Needles. The following Communications were received from him, an explanatory Engraving is annexed, and a Model of the Apparatus preserved in the Society's Repository.*

SIR,

Having invented and made a Model of an apparatus for removing the particles of dust and steel necessarily arising in the pointing of needles on the dry grindstone, which appears to me to be very simple and effective, I am induced to send it to you, requesting you will have the goodness to lay it before the Society for their judgment.

I am, Sir,
Your most obedient humble Servant,
GEORGE PRIOR, Jun.

Otley, Yorkshire, March 1st, 1813.

To C. Taylor, M.D. Sec.

Observations made by Mr. G. Prior.

This method of taking away the particles of dust and steel which float in the air by pointing needles on the dry grindstone, and which are so prejudicial to the health of the workmen, is effected by causing a current of air to pass the top, sides, and bottom of the grindstone, by a tube inclosing them, which tube is slit lengthways on the sides, top, and bottom, opposite the workman; one end of the tube having a communication with a pair of bellows worked by a crank at the end of the axis of the wheel which turns the grindstone, and the air escaping through the slits or openings in the tube, as it passes the grindstone, forces along with it the dust (which would otherwise float in the room, and be inhaled by the operator) into the receiver which incloses the other side of the grindstone, from which a funnel or hollow tube must be extended into a chimney, or through the external wall, so as to convey them from the apartment where the operator is at work.

It is not necessary to remove the large particles of sand, &c. which are heavy enough to fall to the ground, but only those which are so light as to float in the air, and which, in the act of breathing, are in the common mode drawn into the lungs, producing many disorders, and in very few years prove fatal to the operators.

In grinding the needles, the points must be laid on the grindstone, as nearly under that part of the tube which goes over the top of the stone as convenient, for which purpose the tube is made to move backwards or forwards, so as to suit the most convenient part of the grindstone employed by the workman.

There is a great advantage arising from blowing the air out of the room, as any stagnation of air is thus prevented, and the whole quantity being blown out in a very few minutes, there will always be a renewal of fresh air, which will be very salutary to the workmen, particularly if confined in a small apartment.

One pair of large bellows would be sufficient for many grindstones, if it should be thought more convenient, and every mechanic would know how to apply them.

In the Model, that part of the grindstone is designedly left uncovered, where the rest for the workman's hands ought to be, to shew that the dust, which would be whirled round by the motion of the grindstone, is taken off by the current of air meeting it underneath, and forcing it along the funnel.

GEORGE PRIOR, Jun.

Reference to the Engraving of Mr. George Prior, *Jun. Machine to obviate the ill Effects of grinding the Points of Needles. Plate* 12, *Fig.* 1, 2.

This contrivance consists of a conical box or case, inclosing nearly one half of the grindstone, to receive the dust of steel and stone, made in the operation of grinding, which is caused to enter the box by a current of air produced by a pair of bellows. The Model deposited at the Society's house not containing an exact representation of the machine commonly used for grinding needles, it will be necessary to give some explanation, to shew how the machine may be applied to the common mills. The needle grinding mills are generally very extensive buildings, with numerous apartments, each containing many grindstones for pointing needles, all which are driven by one powerful water-wheel, or other first mover. And the bellows, which are employed in Mr. Prior's plan to carry off the dust, might be made large enough to supply all the grindstones contained in one room, or even one wing of the mill. A A represents a large wheel, giving motion to the grindstone by a band *a* passing round a pulley B, fixed on the axis or spindle of the grindstone C, (which is supported in the usual manner, though not here shewn.) The great wheel is represented in the drawing as if mounted in a frame D D, to be turned by a handle, on the opposite end of the spindle, in the same manner as the wheels used for turning laths or cutler's grindstones; but, in the needle mills, this large wheel is part of the mill, and is generally situated beneath the floor of the room, in which the grindstones are placed, being fixed on a long horizontal shaft, which carries several such wheels, each giving motion to one grindstone. Upon the end, or any other convenient part of this shaft, a crank E is fixed, which, by means of a rod F, gives motion to a pair of double bellows G, constructed and acting in the same manner as those used for organs, being contrived to keep up a constant and regular supply of air. They consist of two distinct parts G and H, the lower one is the feeder, and throws the air into the upper one H, which is the regulator, to equalize the current of air, and make it constant. The feeder G, consists of two boards, the upper *ff*, fixed, and the lower one *ee*, moveable on hinges at its joint, by means of the rod F, as before described. It is connected with the upper board by leather, surrounding all its sides, and neatly folded. In the lower board *ee* is an aperture, covered by a valve, (called by the organ-builders a pallet), opening inwards to permit the entrance of the air, but to prevent its return: through the upper board *ff* is another opening, with a valve shutting downwards; through this the air passes into the regulator H, which is also made with two boards connected by hinges and leather, in the same manner as the feeder; from the regulator the air passes off to the grindstones by a trunk K, extending along the whole length of the mill immediately beneath the floor. When the lower board *ee* of the feeder is depressed by the motion of the crank E and the rod F, the chamber of the feeder is enlarged, and the external air opening the valve in the board *e e*, fills the cavity. When the board is lifted up, this valve closes, and the contained air is forced through the valve in the board *f* into the regulator, the repetition of which motion keeps a constant supply of air in the regulator. The top board *d d* of this is loaded with weights, which, resting upon the included air, forces it out from the regulator, in an equable stream, through the trunk K, and from that to every grindstone in the mill. N O O P is an assemblage of tin pipes, which surround the grindstone, and have openings in the fronts of them, through which the air issues, to carry off the dust. This is *shewn* separately at fig. 2, where M represents a brass socket, which is supposed to be fixed to the floor, and by means of a small pipe communicates with the wind trunk K; into this the end of the pipe N is fitted, and the other end of it being supported by the point of a screw Q, it turns on this as a center; the two pipes O O are soldered into this at right angles, and are united at the top by the short pipe P: in these pipes small slits or crevices are made, as shewn by the dark lines, through which the air issues, and blowing towards the grindstone, carries off the particles of dust into the trunk R, fig. 1, which may be continued forwards at S, through the wall of the building, into the open air; or, if it is turned sideways, as at T, all the trunks R of the other grindstones may be carried into it, which will succeed better, because the whole body of air being thus carried through one common trunk, and being thrown out into the open air in

Mr. Prior's machine to carry off the dust produced in Pointing Needles.

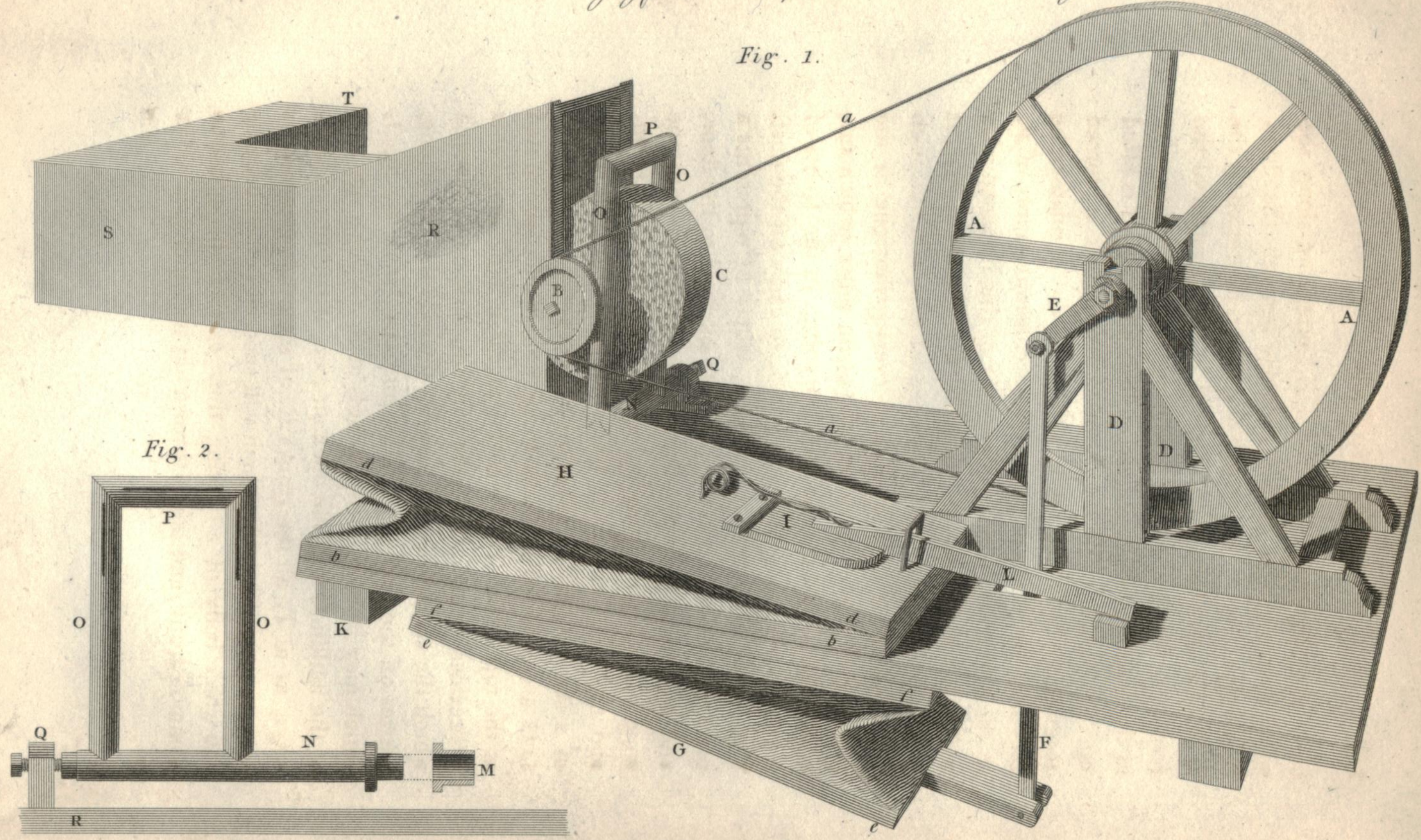


Fig. 1.

Fig. 2.

Farey delin.

Turrell sculp.t

one place, will have the greater force to carry the dust with it. I is a safety valve, covering an opening in the top of the upper board *d d* of the regulator: it is kept shut by a wire spring, and has a wooden handle or tail L, by which it may be lifted up. When the board of the regulator rises as high as is intended, this tail comes in contact with a piece of wood, and thus opens the valve, permitting the air to escape; by which means there is no danger of the bellows being burst, for this valve is always opened when the regulator becomes full, so as to be in any danger of a rupture. The pipes O O P, as beforementioned, turning on a center, can be moved nearer to the grindstone at pleasure, as it becomes reduced in diameter by wearing away.

The SILVER MEDAL *was this Session voted to Mr.* N. DOUGLAS, *of Chiswell-street, for an Instrument for firing Cannon, by which a number of Cannon may be fired in quick succession without the necessity of a Match. The following Communication was received from him, an explanatory Engraving is annexed, and one of the Instruments is preserved in the Society's Repository.*

SIR,

I HAVE sent, for the consideration of the Society, an instrument of my invention for firing cannon. In adopting

ing it, for the use of merchant vessels, it would obviate the great inconvenience of the slow match, and the trouble and delay which I have frequently witnessed in making a poker red hot in order to fire a gun. The gun-locks, which are partially used on board men of war, would be attended with great inconvenience to be used in trading vessels. One of the many advantages which my instrument possesses, is the quickness with which a gun may be fired with it, when the object is found in a right line with it, and the ship in motion. The price of one of these instruments will be about 8*s.*; it is simple in construction, and certain in effect; and it is probable its use on board merchant ships would prevent many from being taken by an enemy, as one or more instruments would scarcely take up any room, and be ready always for immediate use; and one instrument could be employed, in quick succession, to fire many cannon.

I am, Sir,
Your obedient servant,

N. DOUGLAS.

21, *Stangate-street, Dec.* 16*th*, 1812.
To C. TAYLOR, M. D. SEC.

Reference to the Engraving of Mr. DOUGLAS's *Instrument for firing Cannon. Plate* 13, *fig.* 1, 2.

THIS is proposed to be employed as a substitute for the match, in firing cannon, being more expeditious, and less dangerous. The large ships in the royal navy have, for some years past, been provided with locks to their cannons, and have found great benefit from the change, in avoiding the dangers of so many matches which, in an engagement, were blazing in every part of the ship, and very likely, if thrown down by carelessness, to set on fire or blow her up. Merchant's ships have not been able to adopt this plan, on account of the expense, and the danger of locks being out of repair, when they are exposed, as their guns must be, on the open deck. Mr. Douglas's invention will be found of great use in these cases: it will apply to any gun, as readily as a match, but will require no preparation for use, being kept below, and ready for service at all times. It is a spring lock, on a new construction, which is fixed at the end of a handle, and being held above the priming of the gun, throws sparks upon it when discharged by its trigger.

Fig. 1, of Plate 13, is a view of its whole length; and fig. 2, a section, on a larger scale, shewing the interior parts detached. The same letters apply to both. A A is a wooden handle, made hollow, to contain the other parts: but to give access to them for repairs; it is made in two halves, which are united together by twine bound round them near their two ends; the parts within the handle are shewn at fig. 2. Here B B is a brass tube, into which a square iron rod C D is fitted, and slides freely; from this a long cylindrical wire *a* proceeds, and passes through a hole, in the extremity of the tube, which also contains a helical spring, formed of strong steel wire, wrapped round, and constantly tending to throw the rod forwards out of the tube. At the extremity D of the rod is a kind of vice, which, by means of two screws holds a flint *b*; this when thrown out by the action of the spring, strikes against a piece of steel, E F, which may be called the hammer, as it performs the same office as the hammer of the common lock; it has a stem, or tail, screwed fast to the outside of the brass tube, by two screws, at F, and is thus always held opposite to the flint *b*. The trigger is situated at the other end of the handle: it is a catch, G *e*, moving on the center, and pressed by a spring, situated under the end *e*, so that the hook G, at the other end of it, is always in contact with the wire *a*; and when this is sufficiently drawn back the hook falls into a notch in the wire, and retains it until the instrument is to be discharged, by pressing the thumb upon the button *e*, at the end of the trigger; the spring then throws the rod forward very rapidly, and the flint at its end strikes the hammer, and produces sparks sufficient to ignite the priming powder upon the touch-hole of the gun; the instrument being held immediately above it for that purpose.

It may be charged again in an instant after using; to do this the finger and thumb are applied to the projecting extremies of a short wire H, fixed across the other perpendicularly, and coming through the opening H, fig. 1, and another on the opposite side; by this the rod and flint is sufficiently drawn back for the hook of the trigger to catch and retain it, with the spring in its charged state, ready for use. The inside end of the piece of steel E, or hammer, on which the flint strikes, is made inclined to the length of the handle, and curved, as the figure shews, so that the flint will strike obliquely upon it; to increase the effect the stem F is made yielding, like a strong spring, so that the hammer E falls back, in some degree, when struck by the flint, to act like the hammer of a common lock: by which means it produces a greater fire than if it struck upon a fixed hammer, it thus scraping off the ignited particles of steel produced by the stroke.

The SILVER MEDAL, *and* TWENTY GUINEAS, *were this Session voted to Mr.* MALCOLM M'GREGOR, *Bell Yard, Temple Bar, for an improved German Flute, capable of being tuned to a greater extent and certainty than any other. The following Communications were received from him, an explanatory Engraving is annexed, and one of the Instruments preserved in the Society's Repository.*

SIR,

HAVING for a number of years made a series of experiments on musical instruments, I flatter myself that my labour and expenses have not altogether been misapplied; having the satisfaction of knowing that several alterations which I have made in instruments, have been adopted. I am therefore induced to send, for your inspection, a German Flute, in my opinion of an advantageous and convenient construction, as it will admit being tuned in a more extensive and perfect manner, than any hitherto brought before the public. If you should require any explanation respecting its further superiority over those in common use, I will attend for that purpose any time you may appoint, and am,

Sir,

Your obedient humble servant,

MALCOLM M'GREGOR.

No. 29, *Bell Yard, Temple Bar,*
April 13*th*, 1813.

To C. Taylor, M.D. Sec.

Certificates.

Sir,

I have tried your excellent improvement on the German flute; it is decidedly, in my opinion, by far the greatest improvement in its various practical uses, that has hitherto been made on that instrument; more especially in that most desirable and most difficult of all the circumstances attending its practice, of being made perfectly in tune with other instruments, in a greater variety and extent of pitch than has ever been hitherto attained; and I most sincerely wish you the greatest success it merits.

I am, Sir,

Your obedient servant,

John Gunn.

No. 63, *Great Portland-street,*
April 13*th*, 1813.

To Mr. Malcolm M'Gregor,
29, *Bell Yard, Temple Bar.*

SIR,

HAVING tried your improvement on the German flute, I consider it of the greatest utility, in respect to its being tuned to a greater extent and certainty than any I have ever met with.

I am, Sir,
Your obedient servant,
A. DOMEYER.

TO MR. M'GREGOR,
&c. &c. &c.

SIR,

I HAVE tried your flute, and I consider it a very great improvement, in regard of tuning the instrument to various pitches, without the great inconveniences and expense of having so many middle joints.

I am, Sir,
Your's, &c.
ANDREW ASHE.

April 27th, 1813.

TO MR. M'GREGOR.

⁂ MR. MINASSI, Mr. WOOD, Mr. PERCIVAL, and Mr. FRASER, attended the examination of Mr. M'Gregor's German flute, and expressed in high terms their approbation thereof.

Reference to the Engraving of Mr. MALCOLM M'GREGOR'S *Improvement on the German Flute. Plate* 13, *fig.* 3, 4, 5.

THE objects of Mr. M'Gregor's improvement are, to give the means of tuning the instrument perfectly, when required to alter its pitch, which can be done to the extent of a note above, or half a note below, the *concert pitch*, making an extent of a note and a half in the whole; by which means a piece of music may be performed in a different or easier key from that in which it is composed; the same alteration of the pitch being attempted upon other German flutes, would however put them considerably out of tune, so as not to be endured.

It is accomplished by making the instrument draw out proportionately at all the several joints, which unite its parts; by this means, when the cork or stopple is drawn out to lengthen the tube, and thus to lower the pitch of the instrument, the several joints also admit of the tube being lengthened in its different parts, so that the several spaces between the holes, will bear the same relative proportion to the whole tube, in its lengthened state, as they did before the alteration; by this means the sound, produced by all the different parts of the tube, will accord or be in tune with each other.

Figs. 3, 4, and 5, of Plate 13, are different views of this instrument; fig. 3, being a section through the center, in its whole length; fig. 4, an external view, shewing the keys, &c.; and fig. 5, a section of one of the joints, to shew their internal construction.

The flute is made in four lengths, A, B, C, D, which are united by joints, made to draw out, in order to lengthen

Mr. Douglaſs's Instrument for Firing Cannon.

Fig. 1.

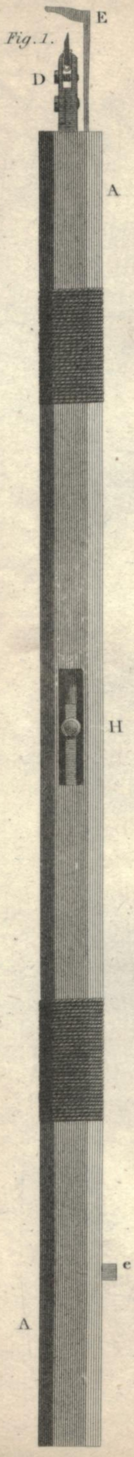
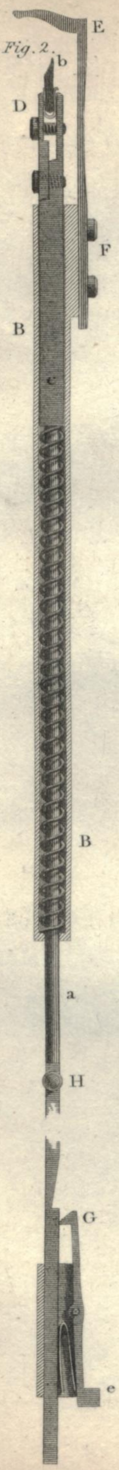


Fig. 2.



Mr. McGregor's Improved German Flute.

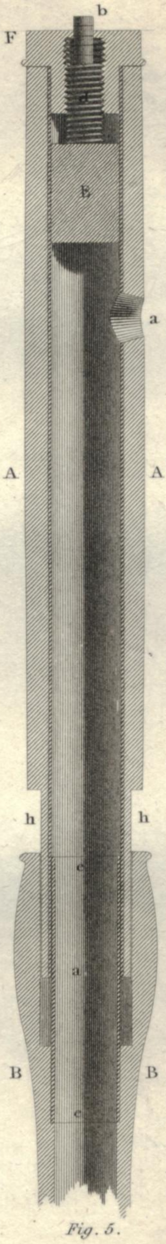


Fig. 5.

Fig. 3.

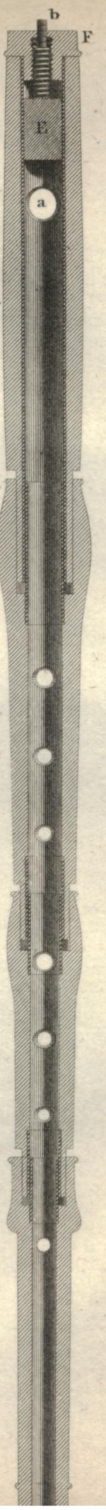
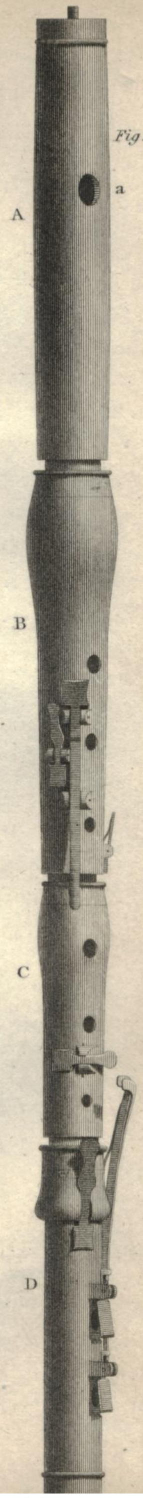


Fig. 4.



lengthen it at pleasure, each joint being fitted with cylindrical metal tubes, sliding like those of telescopes for that purpose; the upper length A has the mouth-hole *a* in it, and the extreme end is shut up by a cork E; as this is required to slide, to alter the length of the tube, it is rendered adjustible by means of a screw *d*, made of ivory, and is part of a piece which goes completely through the cork, and is glued fast to it; the screw *d* is received into an ivory cap F, loosely fitted into the end of the tube, and resting with a flat shoulder upon the end of it; therefore, by turning this nut or cap round, the cork is drawn out, or may be pushed farther into the tube. *b* is a small pin, or tail, projecting from the end of the screw *d*, and coming through a hole in the end of the cap F; it has lines or marks made upon it, which direct how far the cork is to be moved, for the purpose of tuning the instrument to any required pitch. This construction is common to many other German flutes; but in this the three joints, uniting the lengths A, B, C, and D, have also corresponding marks upon them, to shew how much they are to be drawn out, to correspond with the alteration of the cork; and they also completely supply the place of the ordinary *thread joints*, so very inconvenient in use.

Fig. 5, shews one of the joints; here A A is the wood of the upper tube or joint, and B B part of that of the second, which is rather enlarged to admit having a socket bored in it, large enough to receive the tube *h h*, which is formed out of the wood A A, and fits the socket very nearly, but not tight; the principal fitting is made by a thin metal tube, fixed inside the tube B, at *e e*, and is very exactly fitted into the upper tube A, which is lined with a very thin metallic tube, throughout its whole

length,

length, (the other joints having tubes only at their joinings), which prevents it from swelling so much, by the moisture of the breath, as the plain wood would do; and makes also very excellent joints, without the lapping of thread, usually employed in flutes. The interior *e e* tubes, at each joint, have also another effect, that of preserving a perfect bore to the whole tube, as is shewn in fig. 3, which thus diminishes, in a regular manner, from one end to the other, without any other interruption than the different edges of the inner tubes *e e*, which are made very thin, and are scarce discernible. Without these inner metal tubes, sudden enlargements of the tube would take place, at every one of the joints, when they were drawn out, as is shewn in the dark spaces in the section fig. 3: and which cause in the common German flutes, their being out of tune, more or less, when drawn out to alter their pitch.

The holes and keys, shewn in fig. 4, are the same as those used in other flutes, made on the best construction, and are to be used in the same manner; Mr. M'Gregor's improvement relating principally to the tuning at all the joints. The cork E being first adjusted, by screwing the cap F to one of the marks, made upon its pin *b*, the three joints are to be drawn out, to corresponding marks upon the several joint pieces: and when this is done correctly, the holes and keys in the different parts of the tube, will bear their just proportion to each other, and to the whole tube. They will therefore yield sounds which will be a true harmonic relation to each other, and without producing discordant notes, as would be the case if the pitch of the instrument was only altered by the cork at E.

The SILVER MEDAL *of the Society was this Session voted to Mr.* ROBERT HUGHES, *of Ruabon, Denbighshire, for an improvement in the Axis of large Water Wheels, to prevent the Pivot or Gudgeon from getting loose, in the Shaft, or to repair it when damaged. The following Communication was received from him, an explanatory Engraving is annexed, and a Model is preserved in the Society's Repository.*

SIR,

I BEG leave to observe to you, that from the common mode in which the gudgeons, for cranes or water-wheels, are now fixed, they are liable to heat in working, and soon become loose; and by attempting to secure them with wedges, the shaft gets split, injured, and rendered useless.

To obviate such inconveniences, and even to repair an injured shaft, I have invented and practised a plan, which has perfectly succeeded, and of which I have sent a model to the Society.

Upon this plan more firmness and security is given, without weakening the shaft by the deep mortices usually cut therein for fixing the gudgeons. My invention is also cheaper than the old method, in which the hoops alone cost about four guineas, and the cast-iron gudgeon £.2 12*s.*; whereas on my plan the expense of the whole will only be £.4 16*s.* If necessary I will furnish certificates from persons who have made trial of my invention.

I am, Sir,
Your humble servant,
ROBERT HUGHES.

Ruabon, Feb. 12, 1812.

To C. TAYLOR, M.D. SEC.

CERTIFICATES.

ON the 14th June, 1811, Robert Hughes, of Ruabon, instructed me in making a cast hoop gudgeon, for a tumbling shaft of a large and powerful water-wheel for grinding clay for bricks, tiles, &c. which I have found to be a great improvement, as witness my hand this 3d day of October, 1812.

THOMAS EVANS.

Trefynant, Ruabon, Denbighshire.

THIS is to certify, that Robert Hughes, of Ruabon, formed a new construction of gudgeons, for the shaft of a water-wheel he built for me, in the year 1806, which wheel is 28 feet diameter. These gudgeons took in the whole body of the shaft, and wedged the outside. I have not been put to any expense since the making thereof, nor am likely so to be until the shaft decays by time. In short I cannot speak too much in his praise, with regard to his ingenuity and workmanship. Witness my hand, at the Pant Mill, August 20th, 1812.

THOMAS MANLEY.

The wood shaft of a water-wheel, 18 feet diameter, was so worn and decayed at one end, by frequent putting in and wedging of the gudgeon, as to render a repetition of that process impracticable. Robert Hughes, in this difficulty, contrived a cast-iron gudgeon, with a hoop to it, which inclosed the end of the shaft; it was put on and fastened, and has worked steadily ever since. I am informed, that he puts the hoop gudgeon now on new shafts, and it seems to me a great improvement upon the gudgeons formerly in use.

John Jones.

Ruthin, Sept. 14th, 1812.

Reference to the Engraving of Mr. Robert Hughes's *Method of fixing Pivots, or Gudgeons, into the Shaft or wooden Axis of a Water-wheel, which will prevent the danger of their getting loose in the Shaft, and permit their being repaired when damaged. Plate* 14, *fig.* 1, 2, 3.

The ordinary method of fixing gudgeons into wooden shafts, is to have an iron cross, formed on the end of the gudgeon, which is let into the wood, to a considerable depth, and is held fast by small wedges, driven in round it, hoops being fitted round the outside of the shaft, to prevent the wedges splitting it. The defects of this method are, that the shaft is much weakened, by the cutting into it; and the constant strain of a heavy wheel, always acting in different directions, causes the wedges to become loose, and at length fall out; the failure of the gudgeon is frequently attended with more serious damage, for the wheel falling upon the bottom of the race, generally breaks the rim and buckets by its own weight.

The improvement made by Mr. Hughes, consists in applying a cast-iron box to the end of the shaft, and to this the iron cross of the gudgeon is screwed, so as to fasten it more firmly than by the old method, and without weakening the wood by cutting it away. A A, fig. 1, of Plate 14, represents a portion of the end of the wooden shaft, which is of an octagonal form, and has the water-wheel fixed upon it; it is long enough to reach across the pit, in which the wheel works, and having a gudgeon at each end, is supported and revolves upon them in proper bearings B B is the cast-iron box, fitted fast upon the end of the shaft, and being wedged tight, preserves the wood from splitting as effectually as any hoops can do; upon the end of the box is a projecting flanch, *a a*, and in the face of this four grooves or notches are made, for the reception of the arms of the iron cross *b b*, *d d*, which is part of the gudgeon C, on which the shaft revolves; this cross is firmly attached to the box, by four screw bolts, which pass through the flanch, and also through the ends of the arms of the cross, having nuts screwed on the outside to make all fast. The section, fig. 3, shews the cross *b b*, and box B B, separated, to explain the manner of fitting them together, the inside face of the cross having projections *e e*, which enter the end of the box, and keep the pivot in its true center; thus the bolts have only to hold the gudgeons fast on the end of the box, the principal strain being taken off by this manner of fitting the cross into the box.

When the gudgeon of a wheel, fitted on this plan, becomes worn out, so as to require a new one, it can be removed, by taking off the four nuts, and a new one applied.

The cross and gudgeon, being of small dimensions, admit of its cylindrical part C being very conveniently turned in the lathe.

The SILVER MEDAL *was this Session voted to Mr.* JOHN PADBURY, *of Speenhamland, for a Carriage Wheel Guard, by which the Wheel is retained safe upon the Axis in case of the Lynch-pin coming out. The following Communication was received from him, an explanatory Engraving is annexed, and a Model is preserved in the Society's Repository.*

SIR,

FROM a conviction of the good wishes which the Society, for which you act as Secretary, ever feel for ingenuity, in its various branches, I am induced to lay before you a plan of my invention, for the more effectually giving safety to the wheels of carriages, to prevent their breaking, or to avoid any mischief from loss of that very considerable support, the *Linch-pin,* on the dependence of which the lives and limbs of so many are continually exposed.

The plan I now offer for the investigation of the Society, is calculated to obviate the danger which may arise from such an accident; the great repute it has obtained, and the almost general application of it by the coach proprietors of the Bath and other roads, together with the prevention of many accidents, since its adoption, will, I flatter myself, plead a sufficient apology for my offering it to your notice.

I am, Sir,
Your obedient humble servant,
JOHN PADBURY.

Speenhamland, Oct. 1812.

To C. Taylor, M.D. Sec.

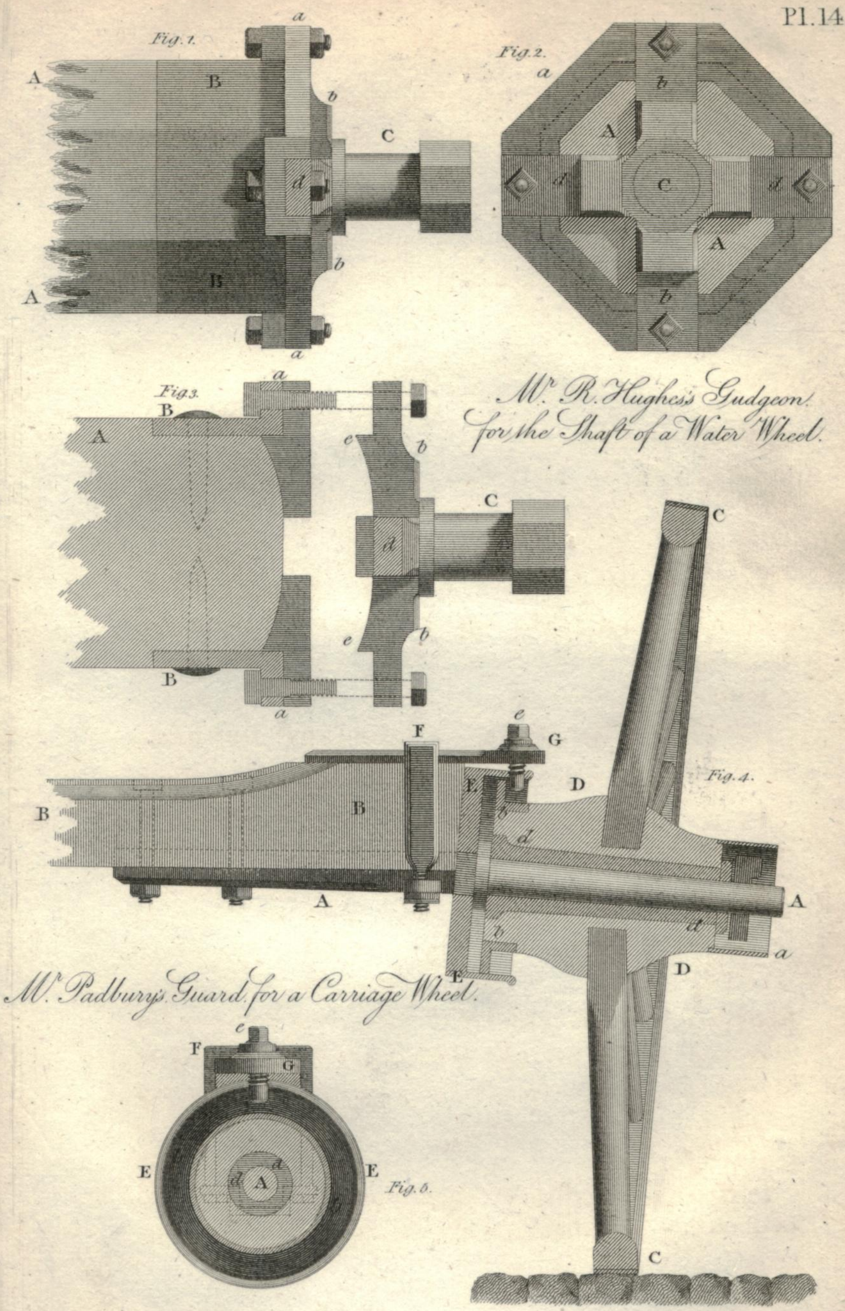
The following gentlemen, residing in this neighbourhood, have inspected the apparatus, and much approve of it. They have done me the honour to affix their names in testimony of its utility.

Joseph Andrews,
William Hallett,
James Croft,
John Wells,
Richard Boucher,
Charles Dundas,
John Disney, Junr.
Anthony Bacon,
Francis S. Stead.

Reference to the Engraving of Mr. John Padbury's *Guard, for a Carriage Wheel, by which the Wheel is retained safe upon the Axle, in case of the Linch-pin coming out. Plate* 14, *fig.* 4, 5.

This contrivance can be applied to any carriage, as it does not require any part of the carriage, or axle-tree, to be

Pl. 14.



Mr. R. Hughes's Gudgeon for the Shaft of a Water Wheel.

Mr. Padbury's Guard for a Carriage Wheel.

Drawn by J. Farey.

Engraved by J. Davis

be altered, farther than the addition of an extra iron hoop upon the inner end of the nave of the wheel.

This is fully explained by figs. 4 and 5, Plate 14, the former being a section, lengthways, of the axletree, and the latter a transverse section; A A represents the iron axletree of a carriage, bolted beneath the wooden bed B B, or frame, of the carriage; C C is the wheel; D D its nave, the axletree box *d d* being fitted through the center of it as usual; *a* is the linch-pin, passing through a mortice in the end of the axletree; E E is a circular box, fastened to the bed B B of the carriage, and surrounding the inner end of the nave of the wheel, to prevent dirt from getting into the axletree; the extra hoop, before-mentioned, which is fixed on the end of the nave, is contained within this box, and runs round without touching it; it consists of a strong hoop *b b*, fixed fast upon the nave, and having a flat circular ring, formed out of the same piece with it: the latter, when fixed, makes a circular projecting rim, upon the end of the nave, as the figure plainly shews.

The same clasp band F, which, by means of two nuts beneath, fastens the axletree A A to the bed of the carriage, also fastens down a piece of iron, G, upon the bed B; in the extremity of this piece of iron is a hole for the reception of a screw *e*, the point of which enters within the box E E, and comes before the projecting ring *b b*, so as to effectually prevent the wheel from coming-off its axle, even if the linch-pin should by accident drop out; the point of the pin *e* is so situated as not to come in contact with the plate *b b*, when the linch-pin is in its place, therefore it occasions no friction to retard the motion of the carriage.

When it is required to take off the wheel, for the purpose of repairs, or for greasing the axletree, the screw *e* is taken out, and the linch-pin being removed, the wheel can be taken off.

In the 27th Volume of the Society's Transactions, at p. 147, will be found a description of an invention, by Mr. J. Varty, of Liverpool, to be applied to the linch-pin of a carriage, to prevent the wheel coming off its axle, if the linch-pin should drop out; this contrivance being wholly applied at the extremity of the axletree, close to the linch-pin, it may be used in combination with Mr. Padbury's invention, and would then render a carriage so secure that it would be scarcely possible for the wheel to come off, by any accident short of the breaking of the axletree: and even then there would be a chance of the wheel being retained, in the circular box E E, by the point of the screw *e*, so as to sustain the carriage from falling, until the horses could be stopped.

The LESSER SILVER MEDAL *of the Society was this Session voted to Mr.* J. WHITFORD, *St. Bartholomew's Hospital, for a Mechanical Substitute, for Leeches, in Bleeding. The following Communication was received from him, an explanatory Engraving may be found in Plate 3, and the Apparatus is preserved in the Society's Repository.*

To the Society for the Encouragement of Arts, Manufactures and Commerce.

GENTLEMEN,

I HAVE taken the liberty of offering myself a second time to your notice, and to lay before you a small apparatus I have lately invented, as a substitute for leeches: a desideratum particularly to be cherished, when it is recollected, in severe frosts, leeches cannot always be procured, and very often at too great a price for the afflicted necessitous to obtain. My invention consists of a small spring instrument, with three triangular pointed lancets, which can be regulated to any degree of depth that may be required; the rest of the apparatus is a small exhausting syringe, with three glasses, of different sizes, to be applied as the nature of the case may require; as frequent complaints have been made by medical men, who were in the habit of using the exhausting syringe and glasses for cupping, that after they had applied the glass, in the usual way, with the pump, if they withdrew the syringe from the glass for the purpose of applying others, the air would frequently get under the valve and cause the glass to fall off; and I feel happy in stating, that I have completely succeeded in the improvement I have made on the cup of the glass, which will prevent the possibility of that occurrence. Notwithstanding the many alterations I have been making on the apparatus for the last four years, I found that I was in the exact situation, as to the mode of applying the glasses, as gentlemen who were in the habit of using the exhausting syringe and glasses for cupping. I could but apply one glass at a time without the danger, if I removed the syringe, of the glass falling off, as it most frequently happens you have occasion to apply two or more leeches. I found it therefore necessary to make a further improvement on the instrument, that you might apply as many glasses at a time as you might think proper, which is done as follows:—I made a small stop cock, on the cap of the glass, under the valve, which, when the glass and syringe is used in drawing up the skin, by turning the stop cock, makes it completely air-tight, so that it is impossible for the glasses to fall off, until you may think proper to remove them. I have the pleasure of presenting several certificates from some of the most respectable of the faculty, who have obligingly given me their opinion; and if you, Gentlemen, should require further explanation respecting my artificial leeches, I will with pleasure attend your summons; and remain,

Your most obedient, grateful,
and very respectful servant,

J. WHITFORD.

Saint Bartholomew's Hospital,
Nov. 18th, 1812.

CER-

CERTIFICATES.

SIR,

I HAVE had frequent opportunities of using your leech instrument, and am happy to inform you, that it has answered far beyond my expectation. I have found it particularly useful in many cases where the indigent class of people have stood in need of leeches, but from the high price could not procure them. I have also found it very convenient in two cases, where the patients had a great aversion even to the sight of the leech, consequently the instrument proved to them its most beneficial effects.

I am, Sir,
Your's, &c.
W. H. ELLIOTT,
Apothecary to the City Dispensary.

City Dispensary, Oct. 20th, 1812.

TO MR. J. WHITFORD,
&c. &c. &c.

SIR,

HAVING attentively examined the instrument you put into my hands, as a substitute for leeches, I am of opinion, that it will afford a valuable means of supplying any deficiency of that very useful reptile, which, from its dearth and scarcity, cannot be employed in many cases.

I am, Sir,
Your very obedient servant,
MICHAEL BARTLETT.

Finsbury Dispensary, St. John-street,
Nov. 13th, 1812.

TO MR. J. WHITFORD,
&c. &c. &c.

Sir,

I have made use of your artificial leech, and from my experience, I think it will prove of great utility. In cases where leeches are necessary I think it will answer every purpose, and in many instances will be preferable. The operation can be performed much cleaner, with considerably less fatigue to the patient, and the quantity of blood taken away can be ascertained with more accuracy than if drawn by the natural leech. The extravagant price of leeches often puts it out of the power of the lower class of people to procure them; and frequently, when procured, they will be found sickly, and their power of action so languid as to disappoint the hopes of the patient, and the expectation of the practitioner: a disappointment which is prevented by the artificial leech; and where prompt and immediate bleeding by leeches is necessary, the possession of the artificial leech appears to me obvious and very desirable.

I am, Sir,
With the best wishes for the
success of your invention,
Your humble servant,
J. Dearing.

Aldersgate-street, Nov. 18th, 1812.
To Mr. J. Whitford,
&c. &c. &c.

We are of opinion that the instrument produced by Mr. Whitford, cannot supersede the use of leeches, but that it may occasionally prove a useful substitute for them.

(Signed) John Pearson,
James Wilson,
Thomas Ramsden,
J. C. Carpue,
Thomas Mainwaring,
S. Cooper,
Henry Earle.

November 24th, 1812.

I have used Mr. Whitford's leech instrument, and approve the same; I consider it a very ingenious contrivance, and will become an excellent substitute for leeches.

J. W. Spry, Surgeon.

Charter-House-square, Nov 24th, 1812.
To C. Taylor, M.D. Sec.

Sir,

I have great pleasure in being enabled to say, that whenever I have used your artificial leech, it has fully answered my expectations; and I cannot help thinking, that during the winter season, when leeches are so exceedingly expensive, and when generally they are more wanted, it will prove a valuable substitute. The addition of the stop cock, as it will preserve a more *perfect vacuum,* will enhance its value.

I am, Sir,
Your humble servant,
John Barnett, Surgeon.

105, *St. John-street.*
To Mr. Whitford,
&c. &c. &c.

Reference to the Engraving of Mr. J. WHITFORD's *Mechanical Substitute for Leeches. Plate* 3, *figs.* 1, 2, 3.

THIS instrument operates nearly in the same manner as the scarificator and cupping-glass, but in a more delicate way; the piercing instrument being provided with sharp points, instead of lancets, so as to make three very small punctures in the skin (instead of incisions, as by the scarificator); upon these a small glass cup is applied, and a syringe used to exhaust the air from it, and increase the flow of the blood.

Figs. 2 and 3, shew the form of the instrument, called the leech; the former being a section through the middle of it, and the latter shewing its outside; it is a brass tube A, having a cover B at one end, through which a screw C passes; this screw has a circular piece of brass *a* fixed upon it, which slides in the tube, and carries the three piercers *b*; a spiral spring surrounds the screw, and presses upon the piece *a*, so as to force it always towards the open end of the tube; but a milled nut *b*, upon the screw C, prevents it going too far; *d* is a small spring catch, fixed within side the tube, and having a button *e* proceeding from it, through the side of the tube; the catch passes through a small square hole in the piece *a*, and has a kind of hook formed upon it, of a similar shape to the hook of a door latch; this, when the screw C is drawn back, by pulling its nut *b*, retains it as shewn in the figure, the spring being fully bent; and in this state the open end of the tube is to be applied upon the part where the bleeding is to be performed; then, by pressing upon the head of the button *e*, the spring catch *d* is discharged, and the spring throws the piece *a* forwards, causing the points *b* to enter the skin, and make the punctures, the depth of which is regulated at pleasure by the nut *b*; which being screwed along the screw C, allows the points to protrude as far beyond the end of the tube as the operator's judgment directs, when the spring is discharged.

Fig. 1, is the syringe and cupping-glass, to be applied after this operation; E is a small glass bell, of which there are several of different sizes provided; it has a brass cap *f*, terminating in a screw *g*, by which it is attached to the end F of the syringe G; this exhausts the air, when the handle H is drawn out in the usual manner; a small valve of bladder being tied over the aperture in the end of the screw *g*, to prevent the re-entrance of the air, when the handle of the syringe is returned; *h* is a small stop-cock, to shut up the passage when the exhaustion is complete, as the valve alone would sometimes be insufficient to prevent the leakage of the air, when the syringe is unscrewed.

The SILVER MEDAL *was this Session voted to* Mr. JOHN STEPHENS, *of Reading, for a cheap Wooden Forcing-Pump, to raise Water from deep Wells. The following Communications were received from him, an explanatory Engraving is annexed, and a Drawing of the Pump is preserved in the Society's Repository.*

SIR,

I HAVE sent for the inspection of the Society a cheap Pump, of my invention, by which I draw water from a well 66 feet below the surface of the ground. I think this pump will be very useful in the country, where the water in wells is too deep for common pumps. I consider it to be the best and cheapest wooden pump in use, and the greatest part of it may be made by any common carpenter.

The whole expense of this pump and apparatus was £. 25, and it raises the water 66 feet high. The lower part of the pump-tree is four inches in the bore. The lower part of the rod which passes through the stuffing box is made of brass; the elbow and upper pump-trees are of a two-inch bore, and may be easily made of any kind of wood. It may also be made to act as an Engine for extinguishing fires, by the addition of an air-tight vessel and pipe to its upper part.

I am, Sir,
Your obedient humble servant,
JOHN STEPHENS.

Reading, April 7th, 1813.

To C. Taylor, M.D. Sec.

SIR,

Agreeably to your desire I have put the experiment of my pump in practice. By the power of two men I throw water easily to the height of 18 feet above the surface of the ground, and with a pretty regular stream. I could have thrown it higher if the engine pipe had not been too large. This I consider as a useful method of watering gardens or roads, or to extinguish a fire, if it should happen near to a pump of this kind. It will also fill a cistern at any moderate height.

I have introduced in the drawing a cap and screw, in preference to screwing it to the nossel of the pump, as it is stronger and more to be depended upon; and I would recommend a screw when water is to be raised to a great height, to be made to fit the nossel, that every thing may be ready always for immediate use. The work of this pump is not liable to be injured by frost. Where the well is of considerable depth I would recommend a brass or metal barrel for the piston to work in.

These pumps may be useful for ships, in preventing fire on board. It has been suggested, that cast-iron pipes would answer better, and be cheaper than wooden ones; but this can scarcely be the case, when it is considered the little expense at which these pipes may be made from fir and elm boughs, or beech poles. I have been told, by Mr. George Sims, a person in the habit of making pumps, that he has known beech pump-trees to last sixty years and upwards.

I shall always be ready to give any further information that may be desired upon the subject; and am, with best respects, Sir,

Your's, very sincerely,

JOHN STEPHENS.

Reading, June 11*th*, 1813.

To C. Taylor, M.D. Sec.

Reference to the Engraving of Mr. Stephens's *Forcing Pump, in Wood, for deep Wells. Pl.* 15, *figs.* 1, 2, 3, 4.

Fig. 1, Plate 15, is a section of a well, in which a pump of this kind is fixed; A A, represents the surface of the ground, and B B, the brick-work of the well, in which

the

the water stands at the level C, and is, by the pump, to be raised to the surface A A.

D is the lever or handle of the pump, which has the rod *a* jointed to it, and descending to the pump; the rod is made of wood, in several lengths, which are united by joints of iron, in the manner shewn at fig. 4; the wooden rods, *a a*, being capped with iron forks *b*, which include the ends of them, and are rivetted fast; the ends of the forks are jointed together to connect the several lengths.

E is the working barrel, or chamber, of the pump, in which the bucket *d* works; this part is formed of a tree, bored through, and having a projecting branch *e*, which is likewise bored obliquely to the barrel, and forms the forcing pipe; in the bottom of the barrel the suction valve *f* is situated, being at the top of the suction part of the pump, which is bored with a smaller auger than the working chamber, which is also lined with a brass tube, where the bucket works. The top of the barrel is covered by a metal lid *g*, (see also figs. 2 and 3,) which has a stuffing box in the center to receive the metal cylindrical part of the pump rod *h*; to the lower extremity of this the bucket *d* is fixed. The metal lid consists of a ring, which is screwed to the wooden barrel by five screw-bolts, passing through as many ears, projecting from the circumference of the ring; they have eyes below, to hook upon pins, which are fixed in the wood, but project sufficiently for these bolts to hold, and are formed into screws above, so as to hold the ring firmly down, by means of nuts screwed upon them. The moveable lid of the pump, which has the stuffing-box g formed in the center of it, is screwed to the ring, by five screws, and these can be taken out to remove the lid, and draw up the bucket when it requires to be leathered.

F is

PL. 15.

Mr. Stephens Forcing Pump.

Fig. 1.

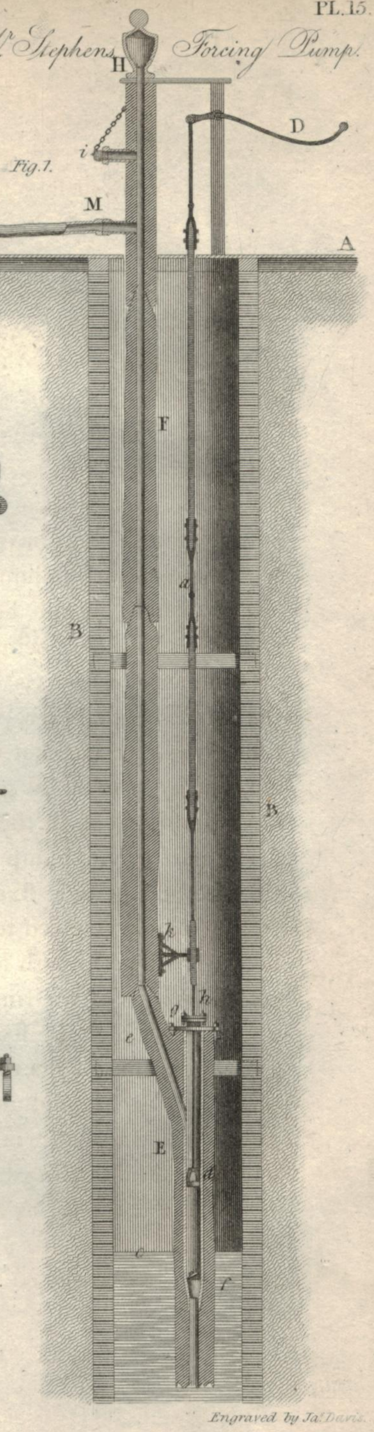


Fig. 2.

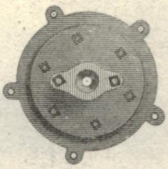
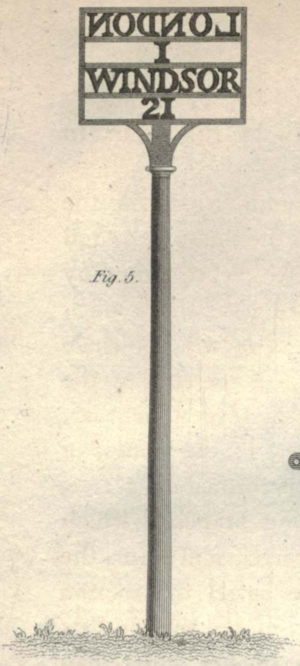


Fig. 5.

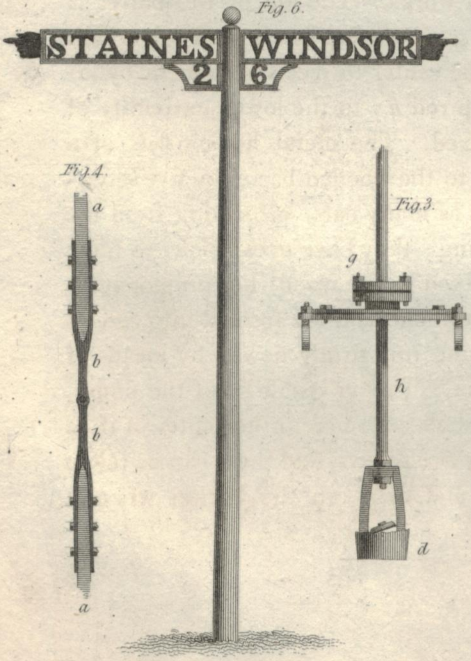


Mr. Jas. Swaines Hand Post.

Fig. 6.

Fig. 4.

Fig. 3.



Drawn by J. Farey.

Engraved by Jas. Davis.

F is the forcing pipe, formed of as many pieces of wooden pipes as is required to make up the length; they are united together by making the upper ends conical, to enter a similar cavity, made in the lower end of the next pipe; the lowest piece fits upon the extremity of the projecting branch *e*, and a valve is proposed to be put in the pipe, at this joint, to prevent the return of the water, and bear part of the weight of the column from the lowest valve at *f*; the upper length of the pipe has a spout *i*, at which the water is delivered.

M is a second spout, fixed into the pipe lower than the former; it has a screw, by which it can be united to a hole, or leather pipe, to convey the water to a distance: or by means of a jet, or branch-pipe, to throw it in the manner of a fire engine; in this case the upper spout *i* must be stopped up, by a screw plug or cap; and there is a copper air-tight vessel H, situated at the top of pipe F, to equalize the pulsative motion of the water, as thrown by the pump.

k is a bracket fixed to the pipe F, and projecting over the center of the pump, where it has a hole to receive the pump rod *h*, and guide it steadily in its motion up and down, that it may not wear the stuffing box away on one side. As the wooden tubes of which the forcing pump F is composed may be made from waste or crooked timber, it makes a great difference between the low price of such, and that of the straight trees necessary for common pumps.

A wooden plug may be chained to the pump, betwixt the spouts or nossels M and *i*, so as to be ready to stop that which is not wanted in use.

Mr. Stephens is of opinion, that it is better to place the valve *f* above the level of the water in the well.

The **Lesser Silver Medal** *was this Session voted to Mr.* **James Swaine**, *Piccadilly, for an improved Guide-Post, the Arms of which are made of Cast-Iron, with open Spaces between and within the Letters, so that they can be more easily distinguished either by Day or Night. The following Communication was received from him, an explanatory Engraving is annexed, and a Model is preserved in the Society's Repository.*

SIR,

Any thing which may contribute to the safety and convenience of travelling cannot fail to excite a lively interest in every person who is accustomed to travel either for pleasure or business. The deficiency of direction-posts throughout a great part of the kingdom, and particularly in the cross roads (where the necessity is most evident) together with the mutilated condition by the weather, from want of repair, and from other causes, of the greater part of those which are put up, have long been to travellers sources of well founded complaint: the frequent inconveniences, not to say serious accidents which have occurred, urge the necessity of the adoption of some better mode for directing the benighted traveller to his desired destination: the most eligible plan which has presented itself is, to have the letters made of cast-metal or iron, that by the appearance of the sky through the interstices, they will be legible by night as well as by day, an advantage which must be obvious to every one: the expense, which will be one shilling per letter, will be found considerably less than that of wood, when the durability of the former is opposed to the fragility of the latter. If this plan was generally adopted, no longer would the fatigued traveller pursue an ambiguous road; no more would he be deceived by the delusive hand-post, which, when arrived at, presents to his great disappointment nothing but an extended arm rendered totally useless by the unchecked ravages of time!—This is no chimera, but has frequently been the situation of the projector, and which indeed first suggested to him the idea of his invention, a specimen of which is sent to the Society for their inspection and opinion.

I am, Sir,
Your most obedient Servant,
JAMES SWAINE.

The same plan may with equal utility, be extended to distance posts.

No. 238, Piccadilly, Nov. 11th, 1812.
To C. TAYLOR, M.D. SEC.

SIR,

SINCE I had the honour of sending the model of a guide post, which was approved by the Society, I have made an improvement by placing the distance in the bracket, which adds considerably to its strength and utility. I have the pleasure of acquainting you, that they are likely to be generally adopted. Sir Wm. Gibbons has erected some in the parish of Stanwell, and others will also be erected in that of Almsworth, and in Devonshire, Oxfordshire and Salop:—Some of the Commissioners of the roads have promised to adopt them, and the Surveyors have so far approved of them as to express their intention of introducing them in the drawings where the new roads are to be. I am informed that new roads are about to be made in the Isle of Wight, and that posts according to my plan will be there erected. The model which I have sent includes the improvement.

I am, Sir,
Your obedient Servant,
JAMES SWAINE.

Piccadilly, March 3d, 1813.
To C. TAYLOR, M. D. SEC.

Reference to the Engraving of Mr. JAMES SWAINE'S *Cast-Iron Hand-Post. Plate* 15, *figs.* 5, 6.

Figs. 5 and 6, are two different forms in which this hand-post may be constructed, in the former, two lines of letters are placed one above the other, and included in a square cast-iron frame, placed on the top of the post or stem; the whole is made of cast-iron, the letters consisting of small bars with spaces between them, open, so as to see the light through them, by which means the characters of this hand-post will be legible at night by viewing them against the sky, unless it should be exceedingly dark. The direction of the road is denoted by the manner of disposing the letters, thus in fig. 5, the letters of the word LONDON are reversed, to denote that the direction of London is to the left hand; the word WINDSOR in the line beneath is not reversed, and therefore shews that town lies to the right hand, the number of miles to each place is shewn by figures placed beneath each word, as in the Engravings. In fig. 6, is shewn a hand-post very nearly of the common form, but made in cast-iron with open work; it has two arms which project from the opposite sides of the post, and therefore shew at once the directions of their respective towns; the distances in miles are denoted by figures likewise in open work placed in brackets beneath, and which also serve to support the arms close to the post. These hand-posts would not be expensive if any iron founder was to establish a manufacture of them, for then the patterns to cast them from might easily be made up from loose letters fixed in a frame in the same manner as printing types, so that 2 or 3 alphabets would be sufficient for forming hand-posts for any places which could be required. Their durability, independent of their other advantages, should forcibly recommend this invention to the attention of the trustees for turnpike-roads.

The Lesser Silver Medal, *and* Five Guineas, *were this Session voted to Mr.* A. Young, *Jun. of Bury-street, Bloomsbury, for his Invention of a Fire Escape Ladder, formed instantaneously by the external application of a Jointed Pole to a Window. The following Communication was received from him, an explanatory Engraving is given in Plate* 6, *and a Model of the Ladder is preserved in the Society's Repository.*

SIR,

The many accidental fires, some of which are attended with the most melancholy results, by persons inhabiting the upper apartments (when the fire originates in the lower part of the house) not having the means of saving themselves, have induced me to present the model of a fire escape, which, from the simplicity of its construction, its portability, as it can be conveyed under the arm of any person with the greatest ease, and the very trifling expense attending its making, will I trust, be found deserving of the approbation of the Society.

This escape is so constructed to be at all times serviceable to the person possessing it, as it can be hooked to the front of the window of his apartments, and he will be able to descend by means of a rope ladder; should his neighbour's house be on fire, and any one in need of assistance, he can raise it to the highest part of the house from the street by fixing the joints at the end of each step together, in the manner of a fishing rod, beginning with the hook which is to be placed in the socket of the top step, the other end of the top step to be placed in the socket of the one beneath it, and the same with every other step, which will form as it were a small rod, which may be rested against the wall of the house, by the side of the window, where the person in danger is, who will place the hooks properly, which are made sufficiently large to embrace the thickness of the wall, then, by pulling the ropes at the bottom, each step will be drawn from the socket of the other, and the ladder will be formed. The ropes at the bottom will enable persons in the street to steady the escape, and keep it from the wall.

If, Sir, you will have the goodness to present it to the Committee, at the earliest meeting, you will much oblige,

Sir,

Your obedient Servant,

ADAM YOUNG, JUN.

No. 16, *Bury-street, Bloomsbury,*
April 21, 1813:

To C. TAYLOR, M. D. SEC.

Reference to the Engraving of Mr. YOUNG'S *Portable Ladder Fire Escape. Plate* 6, *figs.* 4, 5, 6.

THIS ingenious contrivance consists of a number of rounds, A, fig 5, forming the steps of the ladder by being united with two ropes B B, which are suspended from an iron frame C, terminating in hooks *a*, which can very conveniently be lodged on the sill of a window, and thus form a convenient ascent, as is shewn in fig. 5; being very nearly the same as the common rope ladders used on board a ship;

a ship; the principal part of the contrivance consists in making the ladder, so that the rounds can be put together in the manner of fig. 4, forming a pole, by which the frame *c*, can be raised up to the window from below; to effect this the ends *e*, of the rounds A, have ferrels fitted fast upon them, and the other ends *f*, are reduced, so as to enter the cavities of the ferrels, which project beyond the end of the wood so as to form sockets for their reception: the iron frame *c*, at the top has a projecting pin *d*, which is connected with the end socket *e*, of the upper round, thus fixing it at the top of it; the small end of this is inserted into the ferrel of the second, which is again fixed at the top of the third, and so on to the bottom, thus a pole is formed as in fig. 4, of all the staves of the ladder united together; by this, the hooks *a a*, at the top of the iron frame, may be raised up to a window cell, and then a single jerk, or pull at the lower end, disunites the staves from one another, and they assume the form of fig. 5, ready for ascending or descending.

The ropes B B, of the ladder are composed of three small lines plaited together, which method gives the means of fastening the staves very securely to them; this is shewn by fig. 6; a hole is bored through the stave at the place where the rope is to be fixed, large enough to receive one of the three lines, and a groove is turned round the outside of it at the same place; then one of the lines are passed through this hole; and the other two passed round in the grooves on opposite sides so as to surround the stave, then all the three being plaited together, make as firm a connection as possible.

The frame C, at the top has two iron rods *b b*, fixed to its sides, which are useful as hand rails to a person getting out of a window upon the ladder; this frame, though large, does not take up any room when the ladder is packed up, because all the staves laid are parallel and rolled up into a bundle, which fits into the curved inside of the frame C, and the whole is tied together by two lines fixed to the ends of the ladder, which serve also to guide and keep it free from the area, rails, &c. of any house.

The SILVER MEDAL *was this Session voted to Mr.* H. R. PALMER, *of Mare-street, Hackney, for his Invention of a Guage, for the purpose of marking a Line along the Centre of any Parallel or Inclined Surface; also for finding the Centre of a Circle, Square, or any regular Polygon. The following Communication was received from him, an explanatory Engraving is annexed, and the Guage is preserved in the Society's Repository.*

SIR,

HEREWITH you will receive a guage which I have invented, for the purpose of marking a line along the centre of any parallel or inclined solid, which I beg to introduce to the Society of Arts, &c. through your hands.

It has been approved by several workmen, to whom I have shewn it. It will mark a centre line with great accuracy, and it is more easy for a workman to measure from a centre line formed. It will assist greatly in making

ing mortices, and will answer also all the purposes of a carpenter's common guage. It will cost about four shillings.

I am, Sir,
Your humble Servant,
H. R. PALMER.

At Mr. Donkins, Fort-place, Bermondsey,
March 3d, 1813.

To C. TAYLOR, M. D. SEC.

Reference to the Engraving of Mr. PALMER'S *Gauge, for marking a Line along the Center of any Parallel or Inclined Surface; also for finding the Center of a Circle, Square, or any regular Polygon. See Plate* 16, *figs.* 1, 2.

Fig. 1, of Plate 16, is a plan, and fig. 2, a perspective view of the gauge, the same letters refer to both figures, the first being drawn at exactly half the real dimensions of it. A A is a square bar of hard wood planed straight, having the two cheeks of wood B D fitted tight upon it, the cheek B, is fixed fast on the end of the bar, whilst the other slides freely upon it, but may be clumped fast, at any required place, by the thumb-screw C; at the end *b*, a common scribing point is fixed in the bar, and with this, and the sliding piece D, it forms the common guage used for describing parallel lines from the edge of any piece of wood-work; the addition made by Mr. Palmer consists of two brass arms E and F, of equal length, which are centered in the two sliding-boards, or cheeks, at *a a*: the other ends are jointed together by the screw G, which is formed into a sharp point beneath to mark the work with. In using this gauge its two cheeks B D, must be set to the width of the piece of wood intended to be scribed and applied, as shewn in fig. 2; it must be evident, that the point of the screw G, will always keep in the center between the two cheeks B D, because the two arms E F, are of equal length, and a line joining their centres *a a* is perpendicular to the cheeks; it may also, as before stated, be used in the manner of the common carpenter's gauge by means of the sliding cheek D, and the marking point projecting below the bar at *b*. This tool will prove much more expeditious in use than the usual method practised by carpenters for finding the centre of any piece of board, &c. viz. by setting the common gauge, as near as can be estimated, to the centre of the piece, and making a mark, and then turning it to the opposite side of the piece, and making another mark, between which, if the distance is made very small, will be found the center, near enough for common purposes.

If the piece of work to be gauged is not parallel in its width, then the screw C must be loosened, and the two cheeks kept pressed together with sufficient force to keep them in contact with the two sides of the work, when the point G will traverse along the center as correctly as if it was parallel; because, in all situations it preserves an equal distance between the two cheeks. The two cheeks have grooves in them to admit the brass arms E and F, when the cheeks are brought into contact.

Five Guineas *were this Session voted to Mr.* **James Stone,** *No. 30, Warwick-street, Golden-square, for an expanding Centre-Bit, by which Circular Holes of various Diameters may be made. The following Communication was received from him, an explanatory Engraving is annexed, and the Instruments are preserved in the Society's Repository.*

SIR,

Having invented an expanding Centre-bit for boring holes in wood, from about one inch to nine inches in diameter, and being advised by many persons who have seen it, to lay it before the Society of Arts, &c. I request the favor of you to submit it to their consideration, as it will in many cases accelerate the business of carpenters and other workmen.

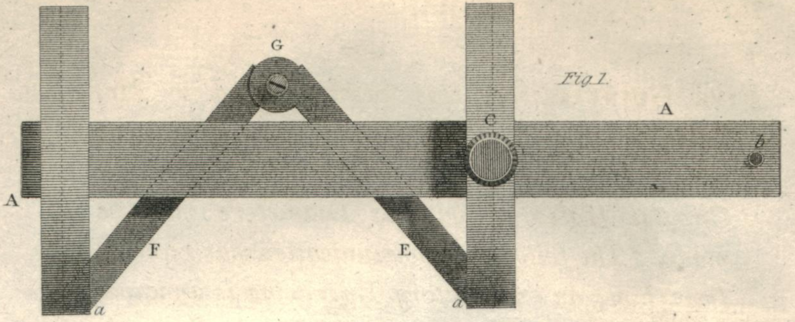
I am, Sir,
Your most obedient humble Servant,
JAMES STONE.

No. 19, Great Titchfield-street, Oxford-market,
March 3d, 1813.

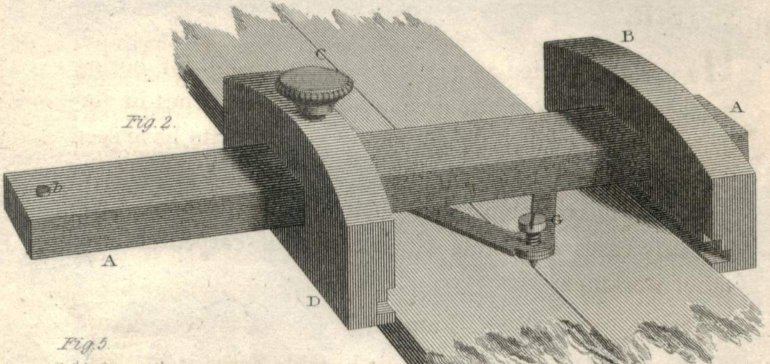
To C. Taylor, M. D. Sec.

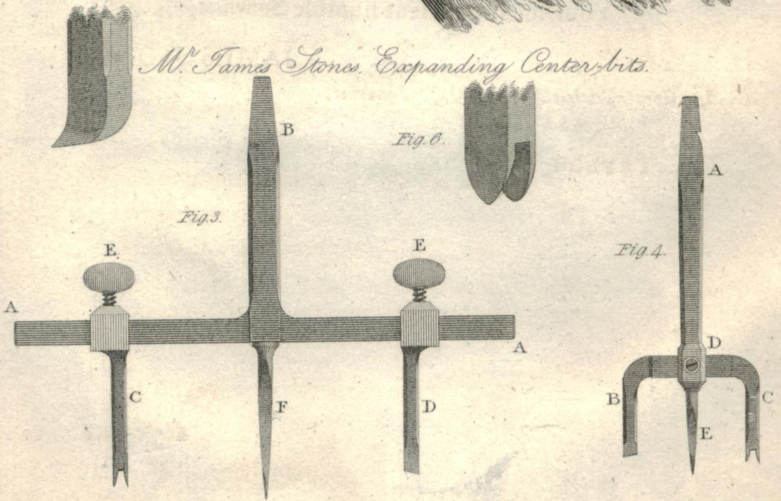
Reference

Pl. 16.



Mr. H. R. Palmers. Gauge for marking Center Lines.





Mr. James Stones. Expanding Center-bits.

Drawn by J. Farey.

Engraved by Jas. Davis.

Reference to the Engraving of Mr. STONE'S *expanding Center-Bit, for boring different sized Holes through Boards, and without wasting the Pieces which are cut out, or employing more Labour than is necessary. See Plate* 16, *figs.* 3, 4, 5, 6.

FIGS. 3 and 4, of Plate 16, explain two different methods of constructing these center-bits ; fig. 3, being for forming very large holes, even as much as 9 or 10 inches in diameter; whilst fig. 4 is for smaller sizes ; but the principal convenience of either is, that it can be set to any required size within its limits. The large tool, fig. 3, consists of a straight bar of iron A A, with a shank B, projecting perpendicularly from it, and formed into a square at top, to be received into a stock or brace, in the manner of a common centre-bit; C D are two cutters sliding upon the bar A, and may be fixed by the screws E E, at any distance from the center-pin F, to regulate the diameter of the hole intended to be cut out. The center-pin F is screwed into the underside of the bar, and its bare and sharp point projects some distance below the edges of the two cutters C D ; the cutter C is made rather longer than D, and is formed into two sharp cutting edges, and prevents the wood from splitting up, and making an uneven hole, by cutting two parallel lines round the circle, for the other cutter D, to follow in, and take out the wood between the lines.

The form of these cutting edges is shewn on a larger scale in figs. 5 and 6, the latter shewing the two sharp scribing edges to cut the sides of the circular groove ; and the other, the sharp hooked edge, which cuts up the wood from between them, in the manner of a chissel.

Fig. 4, shews the construction recommended for smaller expanding centre-bits, the shank A is swelled out at its lower part into a square D, large enough to have a mortise through it for the reception of two arms, which are bent down at right angles at the ends, and form the two cutters B C; these arms lie beside each other in the mortise, and can be removed from the center both ways, to the size of the intended hole, both being bound fast in the mortise by the screw D; the center-pin E, and the two cutting edges, are like those shewn on a larger scale at figs. 5 and 6; the one, fig. 6, coming first into contact with the board to be perforated, makes two deep lines in it, parallel to each other, and of the same distance apart as the width of the opposite cutter, which is shewn at fig. 5, and has a sharp edge formed on a surface rather prominent, so as to cut the wood out between the lines made by the first cutter.

The middle point F, is made pointed and sharp, in order not to impede the action of the cutters when in use.